

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

Part 3: Measurements on satellite earth stations —

Section 3.7: Figure-of-merit of receiving system

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- 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

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National foreword

This British Standard has been prepared by Technical Committee EPL/12 and is the English language version of EN 60835-3-7:1995 *Methods of measurement for equipment used in digital microwave radio transmission systems — Part 3: Measurements on satellite earth stations — Section 3.7 Figure-of-merit of receiving system* published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 835-3-7:1995, 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 2: Measurements on terrestrial radio-relay systems.*

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

This section of BS EN 60835 describes several methods of measuring the figure-of-merit (G/T) of the receiving systems of earth stations.

Reference is required to BS EN 60835-1-2:1995 when using this Section of BS EN 60835.

Cross-references

International Standard	Corresponding British Standard
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> <i>Part 1: Measurements common to terrestrial radio-relay systems and satellite earth stations.</i> <i>Section 2:1995 Basic characteristics</i>

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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 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.

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English version

Methods of measurement for equipment used in digital
microwave radio transmission systems
Part 3: Measurements on satellite earth stations
Section 7: Figure-of-merit of receiving system

(IEC 835-3-7:1995)

Méthodes de mesure applicables au matériel
utilisé pour les systèmes de transmission
numérique en hyperfréquence
Partie 3: Mesures applicables aux stations
terriennes de télécommunications par satellite
Section 7: Facteur de qualité du système de
réception
(CEI 835-3-7:1995)

Meßverfahren für Geräte in digitalen
Mikrowellen-Funkübertragungssystemen
Teil 3: Messungen an Satelliten-Erdfunkstellen
Hauptabschnitt 7: Gütezahl des
Empfangssystems
(IEC 835-3-7:1995)

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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 12E(CO)169, future edition 1 of IEC 835-3-7, prepared by SC 12E, Radio relay and fixed satellite communication systems, of IEC TC 12, Radiocommunications, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60835-3-7 on 1995-05-15.

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) 1996-02-15
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-02-15

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.

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Introduction

The quantity G/T represents the figure-of-merit of an earth station for satellite communication applications.

Two measurement principles may be used in the measurement of the G/T of an earth station, using both direct and indirect measurement methods.

The direct method measures the combined characteristics of the antenna and the receiver and can be carried out using a radio star or other remote transmitter as a suitable signal source.

In the indirect method, the antenna gain and receiver equivalent noise temperature are measured separately and the G/T is calculated from the two measurements.

The choice between the indirect method, which is of low accuracy, and of the higher accuracy, but more complex, direct method, mainly depends on the type of satellite earth station under test.

1 Scope

This section of IEC 835-3 describes several methods of measuring the figure-of-merit (G/T) of the receiving systems of earth stations.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this section of IEC 835-3. 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 835-3 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 835-1-2:1992, *Methods of measurement for equipment used in digital microwave radio transmission systems — Part 1: Measurements common to terrestrial radio-relay systems and satellite earth stations — Section 2: Basic characteristics.*

IEC 835-3-2, *Methods of measurement for equipment used in digital microwave radio transmission systems — Part 3: Measurements on satellite earth stations — Section 2: Antenna.* (under consideration)

ITU-R Recommendation 574-3:1990, *Use of the decibel and the neper in telecommunications.*

3 Definition and general considerations

The figure-of-merit (G/T) of a satellite earth station is a logarithmic quantity which is related to the antenna power gain G, given in decibels, and the absolute temperature T, given in kelvins, by the following expression:

$$G/T = G - 10 \log_{10} (T/1K) \text{ [dB/K]} \quad (1)$$

This definition is in accordance with that given in Recommendation ITU-R 574-3.

The indirect method (see clause 4) is generally usable with all receiving systems, taking into account the lower measurement accuracy of the method, and is the most feasible method for receiving systems with small and medium-size antennas. In these cases, the expected G/T of the receiving systems does not result in a sufficiently large Y-factor to enable the direct method to be used. The indirect method may also be used for earth stations with large antenna systems, either when the tracking capability of the antenna is limited or a suitable remote source does not exist.

The direct method using a radio star (see clause 5) is the preferred method, with maximum accuracy for large antenna systems.

NOTE If the higher accuracy, more complex, direct method is preferred, specialized knowledge and experience is necessary to carry out the measurement.

The direct method using a remote source and reference antenna is also possible for relatively small antennas (see clause 6).

The measurement should always be carried out with clear sky conditions so as to eliminate the effects of rain, snow, cloud, fog, etc.