
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 60835-1-2:1992)

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

iTeh STANDARD PREVIEW

Meßverfahren für Geräte in digitalen Mikrowellen-Funkübertragungssystemen -- Teil 1: Messungen an terrestrischen Richtfunksystemen und Satelliten-Erdfunkstellen -- Hauptabschnitt 2: Grundlegende Eigenschaften

<https://standards.iteh.ai/catalog/standards/sist/9827d28b-a71c-4caa-a159-5236eed28a55/sist-en-60835-1-2-2002>

Méthodes de mesure applicables au matériel utilisé pour les systèmes de transmission numérique en hyperfréquence -- Partie 1: Mesures communes aux faisceaux hertziens terrestres et aux stations terriennes de télécommunications par satellite -- Section 2: Caractéristiques de base

Ta slovenski standard je istoveten z: EN 60835-1-2:1993

ICS:

33.060.30	Radiorelejni in fiksni satelitski komunikacijski sistemi	Radio relay and fixed satellite communications systems
-----------	--	--

SIST EN 60835-1-2:2002**en**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 60835-1-2:2002](#)

<https://standards.iteh.ai/catalog/standards/sist/9827d28b-a71c-4caa-a159-5236eed28a55/sist-en-60835-1-2-2002>

EUROPEAN STANDARD

EN 60835-1-2

NORME EUROPEENNE

EUROPÄISCHE NORM

August 1993

UDC 621.396.6:629.783:621.317.08

Descriptors: Radiocommunications, telecommunications, satellite broadcasting, communication equipment, earth stations, radio-relay systems, microwave frequencies, tests, characteristics, measurements

ENGLISH VERSION

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 835-1-2:1992)

Méthodes de mesure applicables au matériel utilisé pour les systèmes de transmission numérique en hyperfréquence
Partie 1: Mesures communes aux faisceaux hertziens terrestres et aux stations terriennes de télécommunications par satellite
Section 2: Caractéristiques de base
(CEI 835-1-2:1992)

Meßverfahren für Geräte in digitalen Mikrowellen-Funkübertragungssystemen
Teil 1: Messungen an terrestrischen Richtfunksystemen und Satelliten-Erdfunkstellen
Hauptabschnitt 2: Grundlegende Eigenschaften
(IEC 835-1-2:1992)

SIST EN 60835-1-2:2002

<https://standards.iteh.ai/catalog/standards/sist/9827d28b-a71c-4caa-a159-5230c6126a29/sist-en-60835-1-2-2002>

This European Standard was approved by CENELEC on 1993-07-06.

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

FOREWORD

The CENELEC questionnaire procedure, performed for finding out whether or not the International Standard IEC 835-1-2:1992 could be accepted without textual changes, has shown that no common modifications were necessary for the acceptance as European Standard.

The reference document was submitted to the CENELEC members for formal vote and was approved by CENELEC as EN 60835-1-2 on 6 July 1993.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1994-08-01
- latest date of withdrawal of conflicting national standards (dow) 1994-08-01

ENDORSEMENT NOTICE

The text of the International Standard IEC 835-1-2:1992 was approved by CENELEC as a European Standard without any modification.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60835-1-2:2002

<https://standards.iteh.ai/catalog/standards/sist/9827d28b-a71c-4caa-a159-5236eed28a55/sist-en-60835-1-2-2002>

**NORME
INTERNATIONALE
INTERNATIONAL
STANDARD**

**CEI
IEC**

60835-1-2

Première édition
First edition
1992-04

**Méthodes de mesure applicables au matériel
utilisé pour les systèmes de transmission
numérique en hyperfréquence**

Partie 1:

Mesures communes aux faisceaux hertziens
terrestres et aux stations terriennes de
télécommunications par satellite

Section 2: Caractéristiques de base

<https://standards.iteh.ai/catalog/standards/sist/9827d28b-a71c-4caa-a159-5236eed28a55/sist-en-60835-1-2-2002>

**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 1992 Droits de reproduction réservés — Copyright - all rights reserved

Aucune partie de cette publication ne peut être reproduite ni
utilisée sous quelque forme que ce soit et par aucun
procédé, électronique ou mécanique, y compris la photo-
copie et les microfilms, sans l'accord écrit de l'éditeur.

No part of this publication may be reproduced or utilized in
any form or by any means, electronic or mechanical,
including photocopying and microfilm, without permission in
writing from the publisher.

International Electrotechnical Commission
Telefax: +41 22 919 0300

3, rue de Varembé Geneva, Switzerland
e-mail: inmail@iec.ch IEC web site <http://www.iec.ch>



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE

R

Pour prix, voir catalogue en vigueur
For price, see current catalogue

CONTENTS

	Page
FOREWORD	5
INTRODUCTION	7
Clause	
1 Scope	9
2 Carrier frequency	9
3 Spectrum	11
4 Impedance (admittance)	17
5 Level (voltage/power level, gain)	23
Figures	31
Annex A – Bibliography	37

ITeH STANDARD PREVIEW
(standards.iteh.ai)
[SIST EN 60835-1-2:2002](https://standards.iteh.ai/catalog/standards/sist/9827d28b-a71c-4caa-a159-5236eed28a55/sist-en-60835-1-2-2002)
<https://standards.iteh.ai/catalog/standards/sist/9827d28b-a71c-4caa-a159-5236eed28a55/sist-en-60835-1-2-2002>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

<https://standards.iteh.ai/catalog/standards/sist/9827d28b-a71c-4caa-a159-5236eed28a55/sist-en-60835-1-2-2002>

This section of International Standard IEC 835-1 has been prepared by Sub-Committee 12E: Radio relay and fixed satellite communications systems, of IEC Technical Committee No. 12: Radiocommunications.

The text of this section is based on the following documents:

DIS	Report on Voting
12E(CO)132	12E(CO)138

Full information on the voting for the approval of this section can be found in the Voting Report indicated in the above table.

Annex A is for information only.

INTRODUCTION

Modern test sets often combine a number of different measurement functions under the control of a microprocessor. In this way generally more than one parameter is checked and analysed step-by-step in accordance with specific software programmes.

The results of the measurements are printed or plotted automatically and the programme description and tolerance analysis form part of the presentation of results. An example of such specialized equipment is a network analyser which combines two and four-port measurement facilities in one microprocessor-controlled unit.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 60835-1-2:2002](https://standards.iteh.ai/catalog/standards/sist/9827d28b-a71c-4caa-a159-5236eed28a55/sist-en-60835-1-2-2002)

<https://standards.iteh.ai/catalog/standards/sist/9827d28b-a71c-4caa-a159-5236eed28a55/sist-en-60835-1-2-2002>

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

1 Scope

This section of IEC 835-1 deals with the measurement of basic characteristics common to terrestrial radio-relay systems and satellite earth stations. These basic characteristics apply to all of the frequency ranges employed in the radio systems, i.e:

- radio frequency;
- intermediate frequency;
- baseband (e.g. clock frequency of the digital baseband signal).

The method of measurement for each parameter (e.g. return loss) is presented, wherever possible, as a single clause which is applicable to any of the above frequency ranges. Where exceptions occur, they will be given in the relevant clauses.

2 Carrier frequency

2.1 Definition and general consideration

The carrier frequency is that frequency in the r.f. signal spectrum which is modulated by the information, or baseband, signal. The carrier frequency is normally measured without modulation. If energy dispersal is employed, it should be rendered inoperative, if possible, before making measurements.

2.2 Methods of measurement

The arrangement for measuring frequency using a counter or digital frequency-meter is shown in figure 1. The band-pass filter is required only if spurious signals are present. The amplifier and/or attenuator are required only if the input range of the frequency-meter does not cover the range of levels concerned.

Both the equipment under test and the test equipment itself should be allowed to attain thermal stability before making any measurements.

The digital frequency-meter indications are then read during an interval of, for example, one second, depending upon the integrating time of the instrument used.

Alternatively, a recorder may be used to record the indications of the digital frequency-meter for a number of counts. The number of counts will depend upon whether noise is present or not, and whether this modulates the signal or is superimposed upon it.

Generally, the analysis of a statistical series averaged over several measuring intervals will provide evidence of the repeatability of the results.

NOTE - The above method may also be used when the r.f. carrier is modulated by a zero mean baseband signal, provided that the digital frequency-meter does not introduce errors which depend upon the modulating signal. The averaging interval of the digital frequency-meter should exceed 100 cycles of the modulating signal. Alternatively, e.g. when performing frequency measurements on baseband signals, where a long time is required (10 s or more), several counter readings with a short averaging time can be taken and the average of these readings calculated.

There are also other methods applicable for carrier frequency measurement with modulation. For example, the substitution or interference method using a spectrum analyser as an indicator in conjunction with a synthesizer as a reference frequency source.

2.3 *Presentation of results*

The readings of the digital frequency-meter should be recorded manually or automatically as a function of time. The integrating time and the accuracy of the digital frequency-meter should be stated. When several counter readings are taken they should be tabulated, together with the calculated average value.

The measured accuracy can be expressed as an absolute value, e.g. 50 kHz, or as a fractional value, e.g. one part in 10^{-5} . The nominal carrier frequency should also be stated.

2.4 *Details to be specified*

The following items should be included, as required, in the detailed equipment specification:

- a) nominal value of frequency and required accuracy;
- b) the part of the equipment to be measured and the port at which the measurement is to be made;
- c) permitted frequency tolerance.

3 **Spectrum**

It is necessary to evaluate the spectrum which is to be transmitted by the radio-relay or satellite earth station in terms of wanted or unwanted signals. Wanted signals within the necessary bandwidth are treated under "signal spectrum", and unwanted signals which appear outside the necessary bandwidth are treated under "spurious emissions".

3.1 *Signal spectrum*

3.1.1 *Definitions and general considerations*

In accordance with reference 1 the spectrum of a modulated signal is defined by the following characteristics:

- necessary bandwidth;
- occupied bandwidth;
- out-of-band signal;
- unwanted spectrum components.

The *necessary bandwidth* is a theoretical value which ensures that the information will be transmitted with the required quality, whereas the *occupied bandwidth* is a measurable value within which a specified percentage of the total power of a given signal should lie (e.g. 99 %).

The *out-of-band signal* is that part of the signal which is outside the necessary bandwidth and results from the modulation process and/or caused by spectral restoration or spectral spreading.

Unwanted spectrum components within the necessary bandwidth are also measured.

NOTE - Unwanted components with an inadmissibly high level in the transmitted signal usually adversely affect the error ratio. These components therefore have a different significance in digital systems than in analogue systems.

3.1.2 *Methods of measurement*

A suitable measuring arrangement is shown in figure 2.

To measure the spectrum of the modulated signal, a random bit sequence modulation may be applied. This bit sequence is usually generated by a pseudo-random generator (e.g. a sequence of $2^{23} - 1$ bits for 140 Mbit/s systems). The resolution bandwidth of the analyser should be greater than the bit rate of the pseudo-random bit sequence by a factor of 50 to 100 (e.g. for a bit rate of 34 Mbit/s and a sequence of $2^{15} - 1$ bits, the resolution bandwidth is $(50:100) \times 34 \cdot 10^6 / (2^{15} - 1)$, approximately 50:100 kHz).

To measure the level of the unwanted components within the necessary bandwidth it is necessary to operate the equipment under test without modulation.

3.2 *Spectrum of spurious components*

3.2.1 *Definition and general considerations*

According to the Radio Regulations, a spurious emission is an emission on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, *but exclude out-of-band emissions*.

Unwanted signal components may be divided into two categories:

- i) *Spurious components* excluding intermodulation products but including:
 - harmonic signals;
 - parasitic signals;
 - frequency conversion products.
- ii) *Intermodulation products*