
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 4: Transmission performance (IEC 60835-1-4:1992)

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 4: Transmission performance

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Meßverfahren für Geräte in digitalen Mikrowellen-Funkübertragungssystemen -- Teil 1: Messungen an terrestrischen Richtfunksystemen und Satelliten-Erdfunkstellen -- Hauptabschnitt 4: Übertragungsqualität

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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 4: Qualité de transmission

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ICS:

33.060.30	Radiorelejni in fiksni satelitski komunikacijski sistemi	Radio relay and fixed satellite communications systems
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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 4: Transmission performance
(IEC 835-1-4:1992)

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 4: Qualité de transmission
(CEI 835-1-4:1992)

Meßverfahren für Geräte in digitalen Mikrowellen-Funkübertragungssystemen
Teil 1: Messungen an terrestrischen Richtfunksystemen und Satelliten-Erdfunkstellen
Hauptabschnitt 4: Übertragungsqualität
(IEC 835-1-4:1992)

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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 text of the International Standard IEC 835-1-4:1992, prepared by SC 12E, Radio-relay and fixed satellite communications systems, of IEC TC 12, Radiocommunications, was submitted to the formal vote and was approved by CENELEC as EN 60835-1-4 on 1994-03-08 without any modification.

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) 1995-12-15
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 1995-12-15

Endorsement notice

The text of the International Standard IEC 835-1-4:1992 was approved by CENELEC as a European Standard without any modification.

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**Méthodes de mesure applicables au matériel
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Partie 1:

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**Methods of measurement for equipment used in
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Part 1:

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Section 4: Transmission performance

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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 4: Transmission performance**

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.

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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)136	12E(CO)140

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

The transmission performance of a digital transmission system is expressed by several parameters, such as bit-error ratio (BER), jitter and acceptable input interruption.

The BER is the most important parameter related to system transmission performance. Parameters other than the BER, for example, error-free seconds, are applicable to transmission rates up to 64 kbit/s. Their application to higher bit rates is under consideration (see [2]*).

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* References in brackets are given in annex A: Bibliography.

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 4: Transmission performance

1 Scope

This section of IEC 835-1 deals with the measurement of transmission performance and is applicable to simulated digital microwave transmission systems or sub-systems.

The transmission parameters should normally be measured at interface points recommended by the CCITT (see [1]). In special cases when equipment specifications require measurements at other ports (e.g. between modulator input and demodulator output terminals), interface circuits between the measuring equipment and the equipment under test may be necessary.

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2 Bit error ratio

2.1 *Definition and general considerations*
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The bit-error-ratio, BER, is defined as follows (see [3]):

$$\text{BER} = \frac{N_e}{N_t} = \frac{N_e}{Bt_o} \quad (3-1)$$

where:

N_e is the number of bit errors in a time interval t_o

N_t is the total number of transmitted bits in a time interval t_o

B is the bit-rate of the signal at the point where the measurement is made

t_o is the measurement time interval in seconds (error-counting time)

The BER is measured by comparing, bit by bit, the coincidence, or non-coincidence, of the transmitted and received bit streams. The arrangement for BER measurement is shown in figure 1. The comparison of the transmitted and received bit streams is made and the number of errored bits is counted.

The preferred test signal to be applied to the equipment under test is one having a pseudo-random pattern with a pattern length of either $2^{15}-1$ or $2^{23}-1$, depending on the nominal bit-rate of the transmission system (see [4]), but a selectable or programmable word pattern is sometimes used for testing the effect of specific patterns on the BER characteristics.