

Methods of

Measurement for equipment used in digital microwave radio transmission systems —

Part 2: Measurements on terrestrial radio-relay systems —

Section 11: Cross-polarization interference canceller

The European Standard EN 60835-2-11:1997 has the status of a
British Standard

ICS 33.060.30

National foreword

This British Standard is the English language version of EN 60835-2-11:1997. It is identical with IEC 835-2-11:1996.

The UK participation in its preparation was entrusted to Technical Committee EPL/102, Equipment used in mobile services and satellite communication systems, which has the responsibility to:

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Cross-references

Attention is drawn to the fact that Annex ZA list normative references to international publications with their corresponding European publications.

The British Standards which implement these international or European publications may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or using the “Find” facility of the BSI Standards Electronic Catalogue.

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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 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 2: Measurements on terrestrial radio-relay systems
Section 11: Cross-polarization interference canceller

(IEC 835-2-11:1996)

Méthodes de mesure applicables au matériel
utilisé pour les systèmes de transmission
numérique en hyperfréquence
Partie 2: Mesures applicables aux faisceaux
hertziens terrestres
Section 11: Dispositifs d'annulation du
brouillage de polarisation croisée
(CEI 835-2-11:1996)

Meßverfahren für Geräte in digitalen
Mikrowellen-Funkübertragungssystemen
Teil 2: Messungen an terrestrischen
Richtfunksystemen
Hauptabschnitt 11: Kreuzpolarisations-
Interferenz-Unterdrücker
(IEC 835-2-11:1996)

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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 12E/263/FDIS, future edition 1 of IEC 835-2-11, 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 60835-2-11 on 1996-10-01.

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) 1997-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1997-07-01

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

In this standard, Annex ZA is normative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 835-2-11:1996 was approved by CENELEC as a European Standard without any modification.

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1 Scope

This section of IEC 835-2 deals with measurement for cross-polarization interference cancellers (XPIC) used in digital microwave radio-relay systems.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this section of IEC 835-2. At the time of publication, the edition indicated was 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 edition of the normative document indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 835-2-8:1993, *Methods of measurement for equipment used in digital microwave radio transmission systems — Part 2: Measurements on terrestrial radio-relay systems — Section 8: Adaptive equalizer.*

3 Static characteristics

3.1 C/N versus cross-polarization isolation (XPI) (flat fading condition)

3.1.1 General considerations

Cross-polarization isolation (XPI) as defined for two radio waves transmitted with the same power and orthogonal polarizations, is the ratio at the reception point of the power received from one of the waves to the power from the other wave, in the expected polarization of the first wave.

At relatively high C/N values (low noise), the BER is essentially determined by the XPI. A constant BER, for example 10^{-4} , resulting from the cross-polarization interference, will depend on the XPIC performance. Furthermore, it is important to measure the lock-in performance by decreasing the value of the cross-polarization interference from a lock-out state as well as the XPIC performance (hereinafter referred to as ordinary performance measurement) measured by increasing the value of the cross-polarization interference from a lock-in state.

At relatively low C/N values (high noise), the BER is essentially determined by the noise, and the cross-polarization interference will have little effect on the BER. At relatively high XPI values (low cross-polarization interference), there is a point where two curves (with and without the XPIC) meet (see Figure 4). The point determines the operational limit of the XPIC, beyond which the XPIC cannot reduce the interference.

At low XPI values (smaller than about 10 dB), the C/N values at the outputs of the XPIC are sensitive to the phase relations existing within the simulated propagation model. Therefore, if the XPIC is designed to operate for XPI values below 10 dB, a phase variation should contribute a part of the measurement. It is recommended, that the worst case values of C/N be recorded in the results.

3.1.2 Method of measurement

The set-up for the measurements is shown in Figure 3. The two modulators are driven by different pseudo-random binary signals which do not correlate with each other. After the H- and V-polarization signals are divided into main (cross-polarization main signal) and leaky (cross-polarization interference) paths, the four path-lengths are adjusted at the inputs of the receivers to have the same static path length. Adjustable noise (n) and adjustable cross-polarization interference (i) are added to the two main signals.

When C/N and XPI are both higher than about 10 dB, the addition of noise and cross-polarization interference to the cross-polarization main signal path may be omitted because the effect on the measurement results is then negligible. This applies also to the methods of measurement described in 3.2.2, 3.3.2 and 4.2.

C/N and XPI should be set for both (cross-polarization and co-polarization) main signals at the demodulator input as follows. Two bandpass filters which pass the main signals without noticeable degradation may be needed to measure the noise power

- Noise and cross-polarization interference are switched off. Then the main signal power (s) is measured at the output port of the combiner through the calibrated bandpass filter.
- Cross-polarization interference and the main signal are switched off, and the noise power (n) is measured at the above-mentioned port.
- The main signal and noise are switched off, and the cross-polarization interference (i) is measured at the above-mentioned port.
- C/N and XPI are defined as follows:

$$C/N = s/n + 10 \log (B_{\text{CAL}}/B) \text{ (dB)}$$

$$XPI = s/i$$

where

B_{CAL} is the equivalent noise bandwidth of the bandpass filter;

B is the equivalent noise bandwidth of the main signal receiver.