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SIST EN 60244-10:1999

01-januar-1999

Methods of measurement for radio transmitters - Part 10: Methods of measurement for television transmitters and transposers employing (IEC 60244-10:1986)

Methods of measurement for radio transmitters -- Part 10: Methods of measurement for television transmitters and transposers employing insertion test signals

Meßverfahren für Funksender -- Teil 10: Meßverfahren für Fernsehsender und -umsetzer mit Prüfzeilensignalen

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Méthodes de mesure applicables aux émetteurs radioélectriques -- Partie 10: Méthodes de mesure applicables aux émetteurs et réémetteurs de télévision, et utilisant les signaux d'insertion

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2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN STANDARD

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EN 60244-10

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ENGLISH VERSION

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(CEI 244-10:1986)

Meßverfahren für Funksender Teil 10: Meßverfahren für Fernsehsender und -umsetzer mit Prüfzeilensignalen
(IEC 244-10:1986)

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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

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FOREWORD

At the request of 72nd Technical Board, HD 236.10 S1:1988 (IEC 244-10:1986) was submitted to the CENELEC voting procedure for conversion into a European Standard.

The text of the International Standard was approved by CENELEC as EN 60244-10 on 9 March 1993.

The following dates were fixed:

- latest date of publication of an identical national standard	(dop)	1994-06-01
- latest date of withdrawal of conflicting national standards	(dow)	-

Annexes designated "normative" are part of the body of the standard. In this standard, annex ZA is normative.

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ENDORSEMENT NOTICE

The text of the International Standard IEC 244-10:1986 was approved by CENELEC as a European Standard without any modification.

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ANNEX ZA (normative)

OTHER INTERNATIONAL PUBLICATIONS QUOTED IN THIS STANDARD WITH THE REFERENCES OF THE RELEVANT EUROPEAN PUBLICATIONS

When the international publication has been modified by CENELEC common modifications, indicated by (mod), the relevant EN/HD applies.

IEC Publication	Date	Title	EN/HD	Date
244-5	1971	Methods of measurement for radio transmitters - Part 5: Measurements particular to transmitters and transposers for monochrome and colour television	HD 236.5 S4*	1979
244-5B + A1	1975 1978	Part 5: Measurements particular to transmitters and transposers for monochrome and colour television Second supplement: Sections five and six	*	
244-5C	1977	Third supplement: Section seven Unwanted modulation, including hum, noise and intermodulation	*	
244-9	1982	Part 9: Transposers for monochrome and colour television	HD 236.9 S1**	1984

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* HD 236.5 S4 is based on IEC 244-5:1971 + IEC 244-5A:1971 + IEC 244-5B:1975 + IEC 244-5C:1977

** HD 236.9 S1 includes A1:1983 to IEC 244-9

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Methods of measurement for radio transmitters

Part 10: Methods of measurement for television transmitters and transposers employing insertion test signals

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

METHODS OF MEASUREMENT FOR RADIO TRANSMITTERS

Part 10: Methods of measurement for television transmitters and transposers employing insertion test signals

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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PREFACE

This standard has been prepared by Sub-Committee 12C: Transmitting Equipment, of IEC Technical Committee No. 12: Radiocommunications.

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The text of this standard is based upon the following documents:

Six Months' Rule	Report on Voting
12C(CO)171	12C(CO)179

Further information can be found in the Report on Voting indicated in the table above.

The following IEC publications are quoted in this standard:

Publications Nos. 244: Methods of Measurement for Radio Transmitters.
244-5 (1971): Part 5: Measurements Particular to Transmitters and Transposers for Monochrome and Colour Television.
244-5B (1975): Second Supplement to Publication 244-5. Sections Five and Six. Amendment No. 1 (1978).
244-5C (1977): Third Supplement to Publication 244-5. Section Seven – Unwanted Modulation, Including Hum, Noise and Intermodulation.
244-9 (1982): Part 9: Transposers for Monochrome and Colour Television.

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METHODS OF MEASUREMENT FOR RADIO TRANSMITTERS

Part 10: Methods of measurement for television transmitters and transposers employing insertion test signals

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INTRODUCTION

This standard is one of a series of parts of IEC Publication 244: Methods of Measurement for Radio Transmitters, describing recommended methods of measurement for assessing the performance of radio transmitters.

In this standard reference is made to other parts of IEC Publication 244, especially Publication 244-5: Part 5: Measurements Particular to Transmitters and Transposers for Monochrome and Colour Television, and Publication 244-9: Part 9: Transposers for Monochrome and Colour Television.

For the titles of other parts of Publication 244, refer to the inside of the back cover of this publication.

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1. Scope

This standard applies to television transmitters and transposers operating in accordance with television systems for monochrome and colour transmission employing 625 or 525 lines as described in CCIR publications. For details of the characteristics of the various systems, see the CCIR Report [1] mentioned in Appendix C.

2. Object

This standard deals with the application of insertion test signal measurement to television transmitters and transposers.

This method of measurement is useful for checking the line time performance of the transmitters or transposers during programme service and provides a convenient method of testing transmission performance stability during acceptance tests. It may also be used as an alternative means of carrying out some of the line time measurements as described in IEC Publication 244-5 or 244-9 (including supplements).

SECTION ONE – TEST SIGNALS AND LINE SELECTION

3. Introduction

Test signals inserted on selected lines in the field-blanking interval of the composite video signal are termed "insertion test signals" and may be inserted by an appropriate instrument, for example an insertion test signal generator.

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TABLE I

Characteristics of the video signals at the transmitter input and demodulator output for different television standards

	625-line systems $U_n = 700$ mV $U_s = 300$ mV[1]				*525-line systems* $U_n = 714$ mV $U_s = 286$ mV[1]
	B, G, H, K_1	D, K	I	L	M, N
δ_1 (%)	10	12.5 or 15	20	100	10
δ_2 (%)[2]	75	75	76	30	75
U_0 (mV)	808	840 or 875	950	300	824
U_{n0} (mV)[3]	700	700	700	700	714
U_{s0} (mV)	269	280 or 292	300	300	275

1) *Characteristics of the video signal at the input of the (test) transmitter*
U_n = nominal value of the luminance bar amplitude,
U_s = nominal value of the synchronizing pulse amplitude.

2) *Characteristics of the vision signal at the output of the transmitter (or transposer)*
δ_1 = nominal peak white level in percentage of peak carrier*,
δ_2 = nominal blanking level in percentage of peak carrier*.

* In accordance with the CCIR Report [1] mentioned in Appendix C; for System L, without taking into account the chrominance sub-carrier.

3) *Characteristics of the video signal at the output of the demodulator*
U_{n0} = nominal value of the luminance bar amplitude, i.e. the voltage between blanking level and nominal white reference level,
U_0 = the value to which the voltage between zero-carrier and blanking level is to be adjusted, so that $U_{n0} = U_n$,
U_{s0} = nominal value of the synchronizing pulse amplitude, i.e. the voltage between blanking level and nominal synchronizing level.

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4. Insertion test signals

A representative range of insertion test signals is shown in Figures 1 to 8. For ease of reference they are indicated by roman numerals.

The test signals I to IV for 625-line systems are given in Figures 1 to 4, pages 37 and 38.

Figures 5 and 6, page 39, show the test signals V and VI for 525-line systems.

The test signals I to VI are based on the CCIR Recommendation reproduced in Appendix A, to which reference should be made for further details.

The test signals VII and VIII are included for the measurement of certain characteristics not included in the CCIR Recommendation.

Test signal VII, shown in Figure 7, page 40, is used for measuring the in-band intermodulation products caused by intermodulation between the vision and sound carriers and the sideband component corresponding to the chrominance subcarrier in 625-line equipment, particularly for transmitters and transposers employing common amplification of the vision and sound channels. A similar test signal may be used for testing 525-line equipment.

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Test signal VIII, shown in Figure 8, page 41, comprising a signal at blanking level for the full line interval, is used for measuring noise in 625-line equipment. A similar test signal may be used for testing 525-line equipment.

5. Line selection

For out-of-programme service tests, the test signals may be, in principle, inserted in any line in the field-blanking interval.

For tests during programme service, the lines selected for the test signals should be in accordance with relevant CCIR Recommendations and Reports (see Appendix C, reference [4]).

6. Content of the active picture period

It is assumed that all insertion test signals are simultaneously present on the selected lines of the field-blanking interval.

Because the measurement result may depend on the picture content of the other lines, the average signal level during in-programme measurements shall be stated in the presentation of results.

Out-of-programme measurements may be made for different values of average picture level with the luminance level of the active picture lines successively adjusted to correspond to an "all-black picture" and an "all-white picture", and, if required, also to a "mid-grey picture". This shall also be stated in the presentation of results.

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SECTION TWO – GENERAL CONDITIONS OF MEASUREMENT AND INITIAL ADJUSTMENT OF THE EQUIPMENT

7. Manual and automatic methods of measurement

Measurements with insertion test signals can be made either "manually" by means of discrete items of test equipment, such as an oscilloscope, noise meter, etc., or "automatically" by using an insertion test signal analyzer. The analyzer continually scans sequentially the selected performance characteristics and may provide a digital read-out and give an indication when the measured values exceed a predetermined threshold (for example, see the CCIR Reports [5] and [6] mentioned in Appendix C).

The advantages of the automatic method include:

- reduction of measuring time,
- greater measurement accuracy for most characteristics,
- the possibility of recording on paper or tape.

Except where a distinction is made in particular clauses between manual and automatic methods of measurement, the measurement procedures given in this standard are valid for both methods. However, although in the case of automatic measurements the procedure is carried out automatically by the insertion test signal analyzer, the various steps are described as if they were performed manually.

When an automatic method of measurement is used, the analyzer will indicate the mean value of the characteristic measured and the presentation of results shall state the period over which the results are averaged.

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8. Measuring arrangement

The measuring arrangement shown in Figure 9, page 42, comprises the following items of equipment:

- For out-of-programme tests, a video test signal generator capable of delivering a composite video signal, including the colour burst, in accordance with the television standard concerned.

- An insertion test signal generator, capable of delivering the insertion test signals given in Clause 4 above.
- A vestigial-sideband (VSB) demodulator provided with "zero-carrier reference", preferably of the type employing switchable synchronous/envelope detection.

  Envelope detection should preferably be used for the measurement of differential phase. If envelope detection is also used for the measurement of other characteristics, any errors due to quadrature distortion should be taken into account (for example, see the CCIR Report [7] mentioned in Appendix C).
- An insertion test signal analyzer for the automatic method of measurement, or an oscilloscope with line selector for the manual method of measurement.
- In addition, for the measurement of transposers, a test transmitter capable of delivering modulated vision and sound signals in accordance with the television standard concerned.

In this case, the overall performance of the combination of test transmitter and demodulator, excluding the transposer, must be known and allowed for. See, for example, [PODEMSKI] and also Part E of the CCIR Recommendation [2] mentioned in Appendix C.

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9. Conditions of operation

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The transmitter or transposer shall be set up to its rated output conditions and tested under the general conditions of operation appropriate to the equipment concerned in accordance with IEC Publication 244-5 or 244-9.

10. Adjustment of the VSB demodulator

10.1 *Introduction*

Insertion test signal analyzers are normally calibrated for measurements on a composite video signal of standard level in video distribution networks, for example the signal at the input of a transmitter. The reference voltage employed for all measurements is that voltage corresponding to the nominal value of the luminance bar (or picture) amplitude of the video signal, i.e. 714 mV for Systems M and N and 700 mV for all other systems.

If the analyzer is used for the measurement of the signal at the output of a demodulator, the latter shall be adjusted as set out in Sub-clause 10.2 below, so that the voltage between blanking level and nominal white reference level at the demodulator output is equal to the reference voltage, i.e. the nominal luminance bar amplitude at the transmitter input.

As, unless otherwise stated, the measurement procedures given in this standard are applicable to both automatic and manual methods of measurement, the adjustment procedure described in Sub-clause 10.2 shall also be used in the latter case.

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10.2 *Adjustment procedure*

The procedure described below applies both to systems employing positive modulation and also to systems employing negative modulation of the vision signal.

a) Connect the output of the VSB demodulator to an oscilloscope.

b) Set the video test signal generator to provide an ''all black'' picture.

c) By means of the ''zero-carrier reference'' of the demodulator and its output level control, adjust the voltage between blanking level and zero-carrier to the value of U_0 given in Table I for the television standard concerned or to the value calculated from the formula 10.3a given below.

10.3 *Example of calculation of U_0 and of demodulator output signal waveform*

The values of U_0 shown in Table I are based on the nominal values, δ_1 and δ_2, of peak white level and blanking level stated in the CCIR Report [1] mentioned in Appendix C.

In the case of an equipment specification requiring another value of δ_1 and/or δ_2 within the tolerances stated in the CCIR Report, the value of U_0 shall be calculated from the formula:

$$U_0 = \frac{\delta_2}{\delta_2 - \delta_1} \quad U_n \tag{10.3a}$$

where U_n is the nominal value of the luminance bar amplitude.

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The nominal value of the synchronizing pulse amplitude at the demodulator output is equal to:

$$U_{s0} = \frac{100 - \delta_2}{\delta_2 - \delta_1} U_n \tag{10.3b}$$

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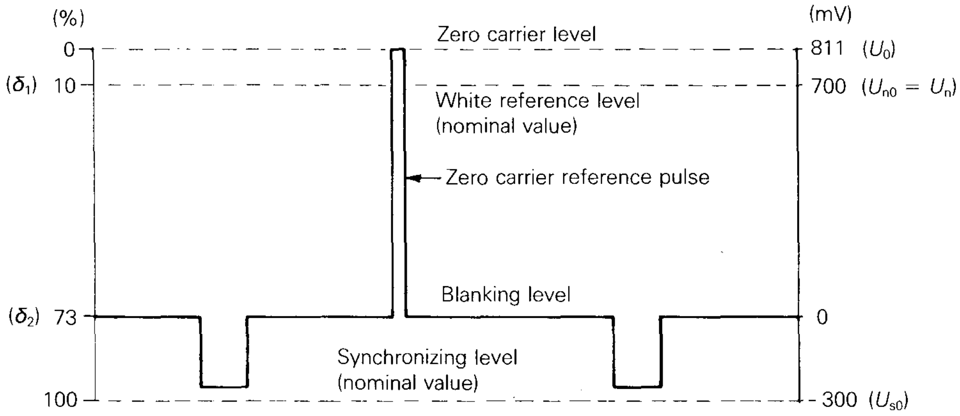
For example, substituting $\delta_1 = 10\%$, $\delta_2 = 73\%$ and $U_n = 700$ mV yields $U_0 = 811$ mV and $U_{s0} = 300$ mV, and results in the demodulator output signal waveform shown in the figure below for a television transmitter with negative modulation, which is adjusted in accordance with Sub-clause 10.2 above and shows a slight synchronizing pulse amplitude error.



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Note. – Except for Systems I and L, the values of δ_1 and δ_2 given in Table I result in the nominal amplitude, U_{s0}, of the synchronizing pulse at the demodulator output to be different from the nominal value U_s at the transmitter input (i.e. 300 mV for all systems, except Systems M and N where $U_s = 284$ mV).

In the case of automatic methods of measurement, this will give rise to a synchronizing pulse amplitude error which is also present when the amplitude of the synchronizing pulse is correct. This fixed error may be taken into account by calculating the actual error in accordance with Item *d)* of Sub-clause 13.2.

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SECTION THREE - MEASUREMENT OF PERFORMANCE CHARACTERISTICS

11. Conformity with other standards

In this standard the definition of each performance characteristic to be measured by a particular test signal is given in the introduction to each measurement procedure. Generally these definitions are in accordance with CCIR Recommendations, for example, reference [3] of Appendix C. In some instances indicated by a note accompanying the particular introduction, the characteristics are also defined in IEC Publications 244-5 and 244-9. The note will explain any divergencies between the definitions and the measurement results obtained.

12. Luminance bar amplitude error

12.1 *Introduction*

The luminance bar amplitude error is the difference between the actual luminance bar amplitude and its nominal value, expressed as a percentage of the nominal value.

The sign of the error is positive if the bar amplitude is greater than the nominal value.

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12.2 *Measurement procedure*

a) Select test signal I for 625-line systems or test signal V for 525-line systems.

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b) Measure the difference in level between points b_1 and b_2, and record this value $U_{1,2}$ in mV.

c) Calculate the error from the expression:

$$100\frac{U_{1,2} - U_n}{U_n} \quad (\%) \qquad (12.2a)$$

where U_n is the nominal value of the luminance bar amplitude given in Table I.

Note. – For television systems with negative modulation the nominal amplitude of the residual carrier should correspond to nominal white reference level.

The residual carrier error, expressed as a percentage of the nominal peak amplitude of the vision carrier, may be calculated by multiplying the luminance bar amplitude error according to Item *c)* above with a constant equal to

$$-\frac{U_n}{U_0 + U_{s0}} \qquad (12.2b)$$

where U_0 and U_{s0} are the values given in Table I or calculated from the formulae 10.3a and 10.3b.

13. Synchronizing pulse amplitude error

13.1 *Introduction*

The synchronizing pulse amplitude error is the difference between the actual amplitude of the synchronizing pulse and its nominal value, expressed as a percentage of the nominal value.

The sign of the error is positive if the synchronizing pulses are larger than the nominal value.