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2007-02

Methods of measurement for radio transmitters –

Part 1: Performance characteristics of terrestrial digital television transmitters

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METHODS OF MEASUREMENT FOR RADIO TRANSMITTERS –**Part 1: Performance characteristics of terrestrial digital television transmitters**

FOREWORD

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International Standard IEC 62273-1 has been prepared by IEC technical committee 103: Transmitting equipment for radio communication

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

FDIS	Report on voting
103/63/FDIS	103/65/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The list of all the publications of the IEC 62273 series, under the general title *Methods of measurement for radio transmitters*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual edition of this document may be issued at a later date.

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METHODS OF MEASUREMENT FOR RADIO TRANSMITTERS –

Part 1: Performance characteristics of terrestrial digital television transmitters

1 Scope

This part of IEC 62273 gives the conditions for measuring the performance parameters of terrestrial digital transmitters and for facilitating the comparison of measurements which are carried out by different personnel. It contains details of specially selected methods for determining the most important performance parameters of digital transmitters. The measurement methods described apply to a limited number of performance parameters, i.e. those which can give rise to ambiguous interpretation due to the use of different methods and conditions. They are neither restrictive nor mandatory: measurements can be chosen for each particular case. If necessary, additional tests can be carried out but they shall comply with those standards which have been established by other study groups, subcommittees of the IEC or other international or suitably accredited organizations.

No limits have been assigned to quantify acceptable ranges of performance parameters. These are judged to be properly included in the technical specifications for individual transmitters; however, the terms and the manner used to quantify them should ideally be those described in a future IEC publication.

The measurement methods described in this standard are intended for type approval tests. However they can equally well apply to acceptance tests measurements and quality control tests either in factories or on site.

Test signals are used to measure performance parameters for both digital and analogue terrestrial transmitters. Their electronic characteristics and their associated performance parameters are widely understood. The test signals are measured after they have gone through the transmitter equipment to determine if their degradation is within the required quality criteria.

This standard does not go into any detail regarding MPEG 2 signals or DVB processes nor does it deal with digital signal processing.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60215, *Safety requirements for radio transmitting equipment*

IEC 60244-1, *Methods of measurement for radio transmitters – Part 1: General characteristics for broadcast transmitters*

ITU-R Recommendation BT.1306-3, *Error correction, data framing, modulation and emission methods for digital terrestrial television broadcasting.*

ITU-R:2004, *Radio Regulations*

ETS 30 0744, *Digital video broadcasting – Framing structure, channel coding and modulation for digital terrestrial television.*

ETSI 101 290, *Digital video broadcasting (DVB) – Measurement guidelines for DVB system*

3 Terms, definitions and abbreviations

For the purposes of this document, the following terms, definitions and abbreviations apply.

3.1

ASI

Asynchronous Serial Interface

3.2

ATSC

Advanced Television Systems Committee

3.3

BER

Bit Error Ratio

3.4

BW

Bandwidth

3.5

C/N

Ratio of the r.f. or i.f. carrier power to noise power

3.6

COFDM

Coded Orthogonal Frequency Division Multiplex <https://standards.iteh.ai/> <https://standards.iteh.ai/standards/iec/62273-1-2007>

3.7

CPE

Common Phase Error

3.8

DVB

Digital Video Broadcasting

3.9

DVB-T

Digital Video Broadcasting baseline system for digital terrestrial television

3.10

END

Equivalent Noise Degradation

3.11

ETS

European Telecommunication Standard

3.12

ICI

Inter Carrier Interference

3.13

IEC

International Electrotechnical Commission

3.14

ISDB-T

Integrated Services Digital Broadcasting for Terrestrial broadcasting system

3.15

ISO

International Organization for Standardization

3.16

ITU

International Telecommunication Union

3.17

JEITA

Japan Electronics & Information Technology Industries Association

3.18

LO

Local Oscillator

3.19

MER

Modulation Error Ratio

3.20

MPEG

Moving Picture Expert Group

3.21

OFDM

Orthogonal Frequency Division Multiplex

3.22

PRBS

Pseudo Random Binary Sequence

3.23

QAM

Quadrature Amplitude Modulation

3.24

RF

Radiofrequency

3.25

RS

Reed-Solomon

3.26

SFN

Single Frequency Network

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4 General conditions of measurement

4.1 Temperature and humidity

Equipment to be measured shall be operated in an environment which meets the temperature and humidity requirements as defined in their technical specifications. Temperature and humidity must never be such as to cause condensation on the equipment during measurements. In the absence of temperature and humidity requirements in the technical specifications, the provisions of IEC 60244-1 shall apply.

4.2 Conditions for primary power supply

The measurement are carried out at the nominal voltage and the nominal frequency of the power supply given in relevant equipment specification.

During a series of measurements carried out as part of one test on one equipment, the voltage and frequency of the power supply shall not deviate from the nominal values more than indicated in the relevant equipment specification.

When the nominal voltage and frequency cannot be obtained during the measurement, the following shall apply.

- a) If the quantities to be measured depend on voltage and/or frequency and the law dependence is known, the values are measured at a voltage and frequency which shall be within the limits laid down in the relevant equipment specification. If necessary, the measured quantities shall be corrected to the nominal voltage and/or frequency by calculation.
- b) If the quantities to be measured depend on voltage and/or frequency and the law of dependence is unknown, the values are measured at a voltage and frequency which shall be within 2 % of nominal voltage and 1 % of the nominal frequency, unless closer tolerances are specified in the equipment specification.

The conditions for primary power voltage and frequency shall be specified in the equipment specification. If the conditions for primary power are not specified, the provisions of IEC 60244-1, Clause 5, shall apply.

Measurements shall be carried out at the nominal voltage and the nominal frequency of the power supply given in the relevant equipment specification.

4.3 Output power

The tests shall be carried out with the transmitter set to its nominal power output after the time for stabilization, as defined in the transmitter technical specification, has elapsed. Nominal output power is taken to mean the average output power as defined by the manufacturer.

4.4 Test load

The impedance of the test load to which the transmitter is connected shall satisfy the following requirements.

The nominal value of the test load shall be the same as the line characteristic impedance for which the transmitter has been designed. The tolerances for this equality shall be the same as the load tolerances as defined in the transmitter technical specification. The test load impedance shall remain adequately constant throughout the required frequency band for test

4.5 Auxiliary equipment

If the transmitter technical specification makes reference to related auxiliary units such as pass-band filters to limit the transmitted signal frequencies or multiplexing units for multiplex transmissions, these units shall be used during the test.

4.6 Test equipment and test signals

These test procedures for digital television transmitters require that the test signals used shall conform to the digital standard implemented in the transmitter (ATSC, DVB-T, ISDB-T) and that the measuring equipment is sufficiently accurate and stable and has the necessary dynamic range to provide error-free measurements of transmitter performance parameters. However, in order to validate the physical layer of the vector r.f. signal that carrying modulating the input signal. In the case of an ASI type signal, an eye-height measurement should be taken at the signal input to the transmitter being tested. The eye-height diagram shows the I and Q time-domain base band modulating signals. Interference caused by distortions which reduce the eye height can be observed. Limits for the eye-height diagram are given in Annex A.

5 General characteristics

5.1 Frequency

5.1.1 General

In order to achieve effective use of the radiofrequency spectrum and limit mutual interference caused by radio services occupying adjacent channels, any departure from the frequency assignees to a transmitter shall be kept within strictly observed limits. These are defined by the International Telecommunication Union and are laid down in the Radio Regulations. The frequency tolerance of frequency bands are given in IEC 60244-1, Annex C. In addition to the above, for the SFN mode, each transmitter frequency shall be kept within reasonable limits to avoid the degradation caused by the frequency deviation of plural transmitters. The acceptable limits for SFN operation depends on the network configuration and transmission parameters; therefore, the acceptable limits for SFN may be specified for each system.

5.1.2 Characteristic frequency

A frequency which can easily be identified and measured in the occupied band of an emission

The term “characteristic frequency” is used in this standard to denote the actual frequency of that component of the emission, the nominal value of which is the assigned frequency.

Complementary information is given in Annex B.

5.1.3 Frequency tolerance

The frequency tolerance is the permissible departure of the characteristic frequency of an emission from the assigned frequency. The frequency tolerance is expressed in parts per 10^6 or in hertz.

5.1.4 Frequency stability

The frequency stability is the extent to which an emission maintains its assigned frequency within frequency tolerance.

A random departure from the assigned frequency is expressed as frequency error.

5.1.5 Frequency error

The frequency error is the difference between the assigned frequency and the characteristic frequency, and shall not exceed the specified frequency tolerance.

The maximum frequency error is expressed in hertz and shall be compared with the frequency tolerance in the ITU Radio Regulations or with the relevant statement in the equipment specification.