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Electromagnetic compatibility and Radio spectrum Matters (ERM); Transmitting equipment for the Digital Radio Mondiale (DRM) broadcasting service Part 1: Technical characteristics and test methods

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European Standard (Telecommunications series)

**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
Transmitting equipment for the Digital Radio Mondiale (DRM)
broadcasting service;
Part 1: Technical characteristics and test methods**

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document is part 1 of a multi-part deliverable covering the Transmitting equipment for the Digital Radio Mondiale (DRM) broadcasting service, as identified below:

Part 1: "Technical characteristics and test methods";

Part 2: "Harmonized EN under article 3.2 of the R&TTE Directive".

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(National transposition dates)

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Introduction

The present document covers a set of non mandatory technical parameters that are considered to be the minimum requirement for the design and operation of a DRM sound broadcasting service.

Other documents directly associated with the present document:

- EN 302 245-2 [1];
- EN 301 489-11 [2].

1 Scope

The present document covers the following types of equipment:

Transmitting equipment for the Digital Radio Mondiale (DRM) sound broadcasting service operating in the LF, MF and HF bands.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

- [1] ETSI EN 302 245-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Transmitting equipment for the Digital Radio Mondiale (DRM) broadcasting service; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive".
- [2] ETSI EN 301 489-11: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 11: Specific conditions for terrestrial sound broadcasting service transmitters".
- [3] CENELEC EN 55022: "Limits and methods of measurement of radio disturbance characteristics of information technology equipment".
- [4] CENELEC EN 55011: "Industrial, scientific and medical (ISM) radio-frequency equipment - Radio disturbance characteristics - Limits and methods of measurement".
- [5] ETSI TR 100 028 series: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
-

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

amplitude imbalance: error caused by different amplification of the I and Q signals

antenna port: port of an apparatus which is designed, in normal operation, to be connected to an antenna using coaxial cable

broadcasting service: radiocommunication service in which the transmissions are intended for direct reception by the general public

NOTE: This service may include sound transmissions, television transmissions or other types of transmission.

cabinet radiation: radiation from an enclosure containing, equipment, excluding radiation from connected antennas or cables

channel bandwidth: frequency band of defined width (as a multiple of the carrier grid) including safety margin for operation on adjacent channels, located symmetrically around a carrier frequency in the carrier grid

class of emission: set of characteristics of an emission, designated by standard symbols

NOTE: Type of modulation of the main carrier, modulating signal, type of information to be transmitted, and also, if appropriate, any additional signal characteristics.

dBc: decibels relative to the unmodulated carrier power of the emission

NOTE: In the cases which do not have a carrier, for example in some digital modulation schemes where the carrier is not accessible for measurement, the reference level equivalent to dBc is decibels relative to the mean power P.

enclosure port: physical boundary of the apparatus through which electromagnetic fields may radiate or impinge

NOTE: In the case of integral antenna equipment, this port is inseparable from the antenna port.

environmental profile: range of environmental conditions under which equipment within the scope of EN 302 245-1 is required to comply with the provisions of EN 302 245-1

harmonic: component of order greater than 1 of the Fourier series of a periodic quantity

harmonic number: integral number given by the ratio of the frequency of a harmonic to the fundamental frequency

NOTE: 2nd harmonic = 2 × fundamental frequency.

intermodulation products: unwanted frequencies resulting from intermodulation between carriers or harmonics of emission, or between any oscillations generated to produce the carrier

mean power: average power supplied to the antenna port by a transmitter during an interval of time sufficiently long compared with the lowest frequency encountered in the modulation envelope taken under normal operating conditions

multiplex: stream of all the digital data carrying one or more services within a single physical channel

necessary bandwidth: for a given class of emission, the width of the frequency band which is sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions

out-of-band emissions: emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions

quadrature error: error caused by phase shift between the I and Q signals

reference bandwidth: bandwidth in which the emission level is specified

RMS power: apparent power of an AC power that is calculated by multiplying root-mean-square (rms) current by the root mean square voltage

NOTE 1: In a purely resistive circuit this is held to be the equivalent heating effect of a DC power and can be deemed to be true power. In a circuit that consists of reactance as well as resistance the apparent power is greater than the true power (the vector difference between true power and apparent power is called reactive power).

$$\text{True Power} = V_{\text{rms}} \times (I_{\text{rms}} \Delta \cos \emptyset)$$

Where $\Delta \cos \emptyset$ is the phase difference between voltage and current introduced by the reactance of the load.

NOTE 2: From the above definition it becomes clear that unless any measuring system can be completely devoid of reactance then the measured power cannot be considered to be RMS power. It therefore becomes apparent that this parameter would be difficult to measure with any degree of accuracy at RF frequencies.

spurious emissions: 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

NOTE: Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out-of-band emissions.

unwanted emissions: spurious emissions and out-of-band emissions

3.2 Symbols

For the purposes of the present document, the following symbol applies:

μ micro

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AI	Amplitude Imbalance
dB	Decibel, logarithmic ratio (tenths of a "Bel")
dBm	dB relative to one milliwatt
COFDM	Coded Orthogonal Frequency Division Multiplex
DRM	Digital Radio Mondiale
EMC	Electro-Magnetic Compatibility
EN	European Norm
EUT	Equipment Under Test
HF	High Frequency
I	In-phase component of a signal
ITU	International Telecommunications Union
LF	Low Frequency
LV	Low Voltage
MER	Modulation Error Ratio
MF	Medium Frequency
N	Noise power
OFDM	Orthogonal Frequency Division Multiplex
Q	Quadrature phase component of a signal
QE	Quadrature Error
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
RMS	Root Mean Square
s	second (unit of time)
V	Volt
W	Watt

4 Technical requirements specifications

4.1 Environmental profile

The environmental profile for operation of the equipment shall be declared by the supplier. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the required operational environmental profile.

4.2 Transmitter output characteristics

4.2.1 Rated output power

4.2.1.1 Definition

The rated output power is the mean power that the transmitter shall deliver at its antenna port under the manufacturers specified conditions of operation.

NOTE: It is, however, recommended that this parameter is not quoted as RMS power.

4.2.1.2 Method of measurement

4.2.1.2.1 Initial conditions

Test environment:

- the normal operating environment, as declared by the equipment manufacturer.

Test frequencies:

- 1) the lowest operating frequency of the EUT;
- 2) the highest operating frequency of the EUT;
- 3) a frequency mid-way between 1) and 2) above.

Test arrangement (see figure A.1):

- 1) all ports unused at the time of testing shall be correctly terminated;
- 2) connect the EUT to the test load, via the coupling device or via the attenuator;
- 3) connect the measuring device to the coupling device or attenuator.

4.2.1.2.2 Procedure

The power of the signal of a DRM transmitter is defined as the long-term average of the time-varying short-term signal power. An appropriate instrument for low power DRM transmitters is a thermal power meter; for high power DRM transmitters a calorimetric method may be used.

4.2.1.2.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.1.3 in order to demonstrate compliance.

4.2.1.3 Limit

The mean output power shall be within $\pm 10\%$ of the rated output power under normal operating conditions as defined by the manufacturer.

4.2.2 Frequency stability

4.2.2.1 Definition

The frequency stability of an emission is the variation of frequency against a predetermined time scale.