SLOVENSKI STANDARD
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Elektromagnetna združljivost in zadeve v zvezi z radijskim spektrom (ERM) ï Oddajniġka oprema za storitev prizemne digitalne zvokovne radiodifuzije (T-DAB) ï 1. del: Tehniļne karakteristike in preskusne metode

Electromagnetic compatibility and Radio spectrum Matters (ERM); Transmitting equipment for the Terrestrial - Digital Audio Broadcasting (T-DAB) service; Part 1: Technical characteristics and test methods

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Electromagnetic compatibility and Radio spectrum Matters (ERM); Transmitting equipment for the Terrestrial - Digital Audio Broadcasting (T-DAB) 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 Electromagnetic compatibility and Radio spectrum Matters (ERM); Transmitting equipment for the Terrestrial - Digital Audio Broadcasting (T-DAB) service, as identified below:

Part 1: "Technical characteristics and test methods";

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

National transposition dates	
Date of adoption of this EN:	21 January 2005
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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 T-DAB sound broadcasting service.

Other documents directly associated with the present document:

- EN 302 077-2 [1];
- EN 301 489-11 [2].

1 Scope

The present document applies to the following radio telecommunications terminal equipment types:

- Digital Audio Broadcast - Terrestrial equipment used in the sound broadcasting service.

NOTE: At the time the present document was drafted, the following bands were allocated to T-DAB (Wiesbaden agreement, Maastricht agreement (see bibliography)):

- 47 MHz to 68 MHz;
- 174 MHz to 240 MHz;
- 1 452 MHz to 1 492 MHz.

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 302 077-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Transmitting equipment for the Terrestrial - Digital Audio Broadcasting (T-DAB) 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] ETSI ETS 300 799: "Digital Audio Broadcasting (DAB); Distribution interfaces; Ensemble Transport Interface (ETI)".

[4] CENELEC EN 55022: "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement".

[5] CENELEC EN 55011: "Industrial, scientific and medical (ISM) radio-frequency equipment - Radio disturbance characteristics - Limits and methods of measurement".

[6] IEC 60489-1 amendment 2: "Methods of measurement for radio equipment used in the mobile services. Part 1: General definitions and standard conditions of measurement".

[7] ETSI TR 100 028 (all parts): "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:

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

class of emission: set of characteristics of an emission, designated by standard symbols, e.g. 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 302 077-1 is required to comply with the provisions of EN 302 077-1

exclusion band: band of radio frequencies where no measurements are made

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 (2^{nd} harmonic = 2 x fundamental frequency)

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

L-band: for the purpose of these document L-band is defined as the frequency range from 1 452 MHz to 1 492 MHz

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

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

rated output power: power that the transmitter or transposer shall deliver at its output under specified conditions of operation

reference bandwidth: bandwidth in which the emission level is specified

RMS power: the 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).

True Power = Vrms x (Irms Δ cos Ø)

Where Δ cos Ø 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: emissions 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. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out of band emissions.

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

3.2 Symbols

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

C/N	Carrier power to Noise power density
µ	micro, 10^{-6}

3.3 Abbreviations

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

BER	Bit Error Ratio
COFDM	Coded Orthogonal Frequency Division Multiplex
CRC	Cyclic Redundancy Check
CW	Continuous Wave
EMC	ElectroMagnetic Compatibility
ETI	Ensemble Transport Interface
EUT	Equipment Under Test
FIB	Fast Information Blocks
FIC	Fast Information Channel
Hz	Hertz (cycles per second)
IEC	International Electrotechnical Commission
IF	Intermediate Frequency
ITU	International Telecommunications Union
LV	Low Voltage
N	Noise power
NI	Network Independent layer
PRBS	Pseudo Random Binary Sequence
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
rms	root mean square
SFN	Single Frequency Network
T-DAB	Terrestrial - Digital Audio Broadcast
Tx	Transmitter
V	Volt
VHF	Very High Frequency
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 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:

a) the lowest operating frequency of the EUT;

b) the highest operating frequency of the EUT;

c) a frequency mid-way between a) and b) 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 T-DAB transmitter is defined as the long-term average of the time-varying short-term signal power. An appropriate instrument for T-DAB power measurements is a thermal power meter.

NOTE: The signal power is constant symbol by symbol. A certain short-term variation is especially given by the Null symbol.

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 output power shall be within ±0,5 dB 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.

4.2.2.2 Method of measurement

4.2.2.2.1 Initial conditions

Test environment:

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

Test frequencies:

Any one frequency within the tuning range of the EUT.

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.

NOTE: Alternatively the transmitter local oscillator may be measured in order to calculate the frequency stability of the EUT RF output signal.

4.2.2.2.2 Procedure

The characteristic frequency may be measured with any suitable measuring device, provided that the accuracy attained during the measurement is better than approximately 10 % of the frequency tolerance or the frequency stability given in the relevant equipment specification of the transmitter.

For a tight frequency tolerance or a high degree of frequency stability, the measuring accuracy stated above puts higher demands on the accuracy of the measuring equipment.

In this case, the measurements shall preferably be made with a recording instrument.

The accuracy of the measuring method, if known, shall be stated with the results of the measurements. If not known, an estimate should be given.

The conditions of operation shall also be given together with the assigned frequency of the emission, which has been used as the characteristic frequency.

4.2.2.2.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.2.3 in order to demonstrate compliance.