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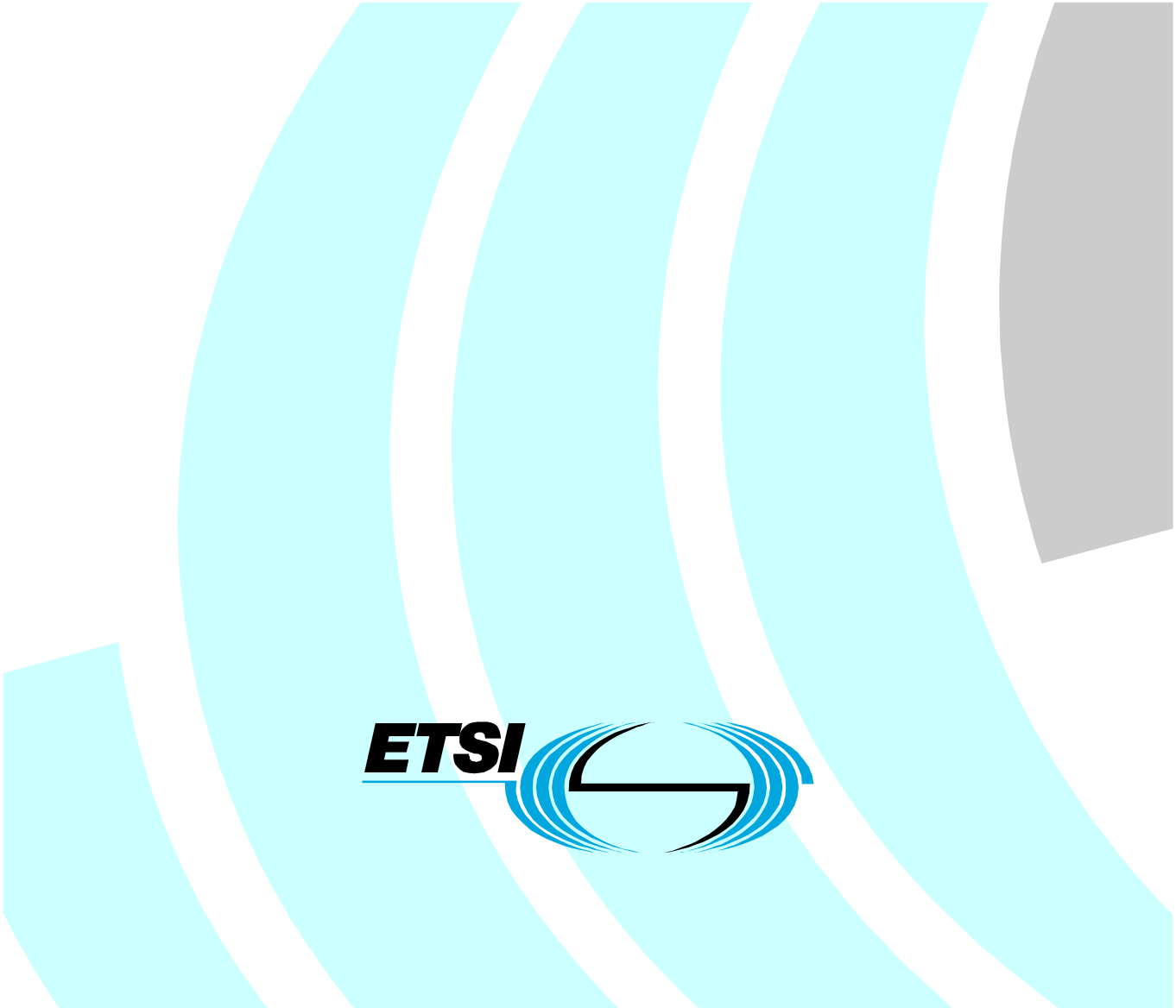
European Standard (Telecommunications series)

Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Transmitting equipment for the Frequency Modulated (FM) radio broadcast service; Part 1: Technical characteristics and test methods



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Contents

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the Public Enquiry phase of the ETSI standards Two-step Approval Procedure.

The present document is part 1 of a multi-part deliverable covering transmitting equipment for the Frequency Modulated (FM) radio broadcast service, as identified below:

Part 1: "Technical characteristics and test methods";

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

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

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 an FM sound broadcasting service.

Other documents directly associated with the present document:

- EN 302 018-2;
- EN 301 489-11.

1 Scope

The present document applies to Transmitting equipment for the frequency-modulated radio broadcast service.

The types of equipment covered by the present document are as follows:

- Transmitting equipment for frequency modulated radio broadcast service operating in both Monophonic and Stereophonic operating in the frequency range 68 MHz to 108 MHz.
- In addition to the present document, other ENs that specify technical requirements in respect of essential requirements under other parts of Article 3 of the R&TTE Directive [1] may apply to equipment within the scope of the present document.

NOTE: A list of such ENs is included on the web site http://www.newapproach.org.

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.

[1] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).

[2] EN 50067: "Specification of the radio data system (RDS) for VHF/FM sound broadcasting in the frequency range from 87,5 to 108,0 MHz".

[3] ITU-R Recommendation 412-5 (1990): "Planning standards for FM sound broadcasting at VHF".

[4] EN 60244-13: "Methods of measurement for radio transmitters - Part 13: Performance characteristics for FM sound broadcasting".

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

3 Definitions, symbols and abbreviations

3.1 Definitions

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

broadcasting service: radio communication service in which the transmissions are intended for direct reception by the general public. This service may include sound transmissions, television transmissions or other types of transmission.

Carrier Power: average power supplied to the antenna transmission line by a transmitter during one cycle taken under the condition of no modulation

class of emission: the 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

composite: See 'Multiplex (MPX) signal'.

difference signal: signal theoretically equal to half the difference between the left and right stereophonic signals, and in practice proportional to this difference

enclosure port: physical boundary of the apparatus through which electromagnetic fields may radiate or impinge. In the case of integral antenna equipment, this port is inseparable from the antenna port

Mean Power: average power supplied to the antenna transmission line 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 (MPX) signal: contains all information, including the pilot tone and any supplementary signal which is used to frequency modulate the VHF FM transmitter

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

pilot tone: the 19 kHz tone used to recover the stereo subcarrier in the stereo-receiver

Radio Data System (RDS): signal containing information on programmes and broadcasting network as defined in EN 50067.

NOTE: This signal is carried by a subcarrier at 57 kHz, amplitude modulated by the encoded data with suppressed carrier in a frequency band of ± 2,4 kHz.

Reference Bandwidth: bandwidth in which the emission level is specified

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

stereo subcarrier: 38 kHz subcarrier used to carry the difference signal

sum signal: signal theoretically equal to half of the sum of the left and right stereophonic signals, and in practice proportional to this sum

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:

Ω	ohms (unit of resistance)
μ	micro, 10^{-6}

3.3 Abbreviations

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

a.c.	alternating current
AF	Audio Frequency
d.c.	direct current
dBc	decibels relative to the unmodulated carrier power of the emission
EMC	Electro-Magnetic Compatibility
emf	electromotive force
EUT	Equipment Under Test
FM	Frequency Modulation
LV	Low Voltage
MPX	MultiPleX

R&TTE	Radio equipment and Telecommunications Terminal Equipment
RDS	Radio Data System
rms	root mean square
s	second (unit of time)
SINAD	Signal + Noise + Distortion / Noise + Distortion
S/N	Signal to Noise
Tx	Transmitter
V	Volts
VHF	Very High Frequency

4 Technical requirements specifications

4.1 Transmitter input configuration

If the transmitter does not incorporate a stereo encoder and is intended for stereo operation then a suitable test encoder shall be used.

4.2 Transmitter output characteristics

4.2.1 Rated output power

4.2.1.1 Definition

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

4.2.1.2 Method

The test defined in clause 5.2.1 should be applied.

4.2.1.3 Limit

The carrier output power shall be within ± 1,0 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

The test defined in clause 5.2.2 should be applied.

4.2.2.3 Limit

For a period of not less than ninety days, the frequency of the transmitter shall stay within the tolerance of ±2 kHz.

4.2.3 Transmitter muting during frequency shift.

4.2.3.1 Definition

The suppression of emissions during the retuning of transmitters, or the loss of carrier frequency control. This is particularly relevant to frequency agile transmitters incorporating frequency control loops.

4.2.3.2 Method of measurement

The test defined in clause 5.2.3 should be applied.

4.2.3.3 Limit

The Muting shall be as defined in table 1

Table 1

Limits Mean power absolute levels (dBm) or relative levels (dBc) below the power supplied to the antenna port in the reference bandwidth	
-36 dBm	P ≤ 9 dBW
75 dBc	9 dBW < P ≤ 29 dBW
-16 dBm	29 dBW < P ≤ 39 dBW
85 dBc	39 dBW < P ≤ 50 dBW
-5 dBm	50 dBW < P
where P is the mean power of the transmitter (W)	
NOTE: Within the band 108 to 137 MHz the absolute limit of 25 μW shall apply.	

4.2.4 Maximum frequency deviation

4.2.4.1 Definition

The maximum frequency deviation is the maximum difference between the instantaneous frequency of the modulated radio frequency signal and the carrier frequency in the absence of signal.

4.2.4.2 Method of measurement

The test defined in clause 5.2.4 should be applied.

4.2.4.3 Limit

The maximum frequency deviation applied to the radio-frequency carrier must not exceed ±75 kHz by more than 5 positive-going or 5 negative-going excursions in any 5-second period of programme service. Where an excursion above ±75 kHz exceeds 10 msec duration, it shall be divided into discrete 10 msec periods (rounded up) and counted accordingly. Under no circumstances is the deviation to exceed ±80 kHz other than by anomalous behaviour.

4.2.5 Deviation sensitivity stability

4.2.5.1 Definition

Required Audio or MPX input level to the transmitter to achieve desired deviation.

4.2.5.2 Method of measurement

The test defined in clause 5.2.5 should be applied.

4.2.5.3 Limit

The deviation sensitivity of the transmitter shall remain within ± 3 % of the declared value under the manufacturers declared operating conditions. However for frequency-agile transmitters the deviation sensitivity shall remain within ± 5 % of the declared value under the manufacturers declared operating conditions.

4.2.6 Hum and noise

4.2.6.1 Definition

The amplitude modulated noise and hum level is the peak voltage at the output of a linear envelope detector, in the absence of any modulation signal. The result is expressed as a percentage of the D.C. component of the envelope detector output.

4.2.6.2 Method of measurement

The test defined in clause 5.2.6 should be applied.

4.2.6.3 Limit

The permitted level of residual AM in the absence of modulation shall not exceed 1 % when measured in a bandwidth of 20 Hz to 20 kHz (unweighted).

4.2.7 Synchronous AM

4.2.7.1 Definition

Synchronous amplitude modulation is evaluated by measuring the peak voltage of the a.c. component at the output of a linear envelope detector due to presence of a specified modulating signal. The result is expressed as a percentage of the d.c component corresponding to the unmodulated carrier.

4.2.7.2 Method of measurement

The test defined in clause 5.2.7 should be applied.

4.2.7.3 Limit

The permitted level of AM due to FM shall not exceed 2 % for a peak deviation of ± 40 kHz at a modulation frequency of 500 Hz.

4.2.8 Modulator performance

4.2.8.1 Definition

The amplitude and phase performance required for the transmitter to ensure compliance with maximum frequency deviation.

4.2.8.2 Method

The test defined in clause 5.2.8 should be applied.

4.2.8.3 Limit

The deviation limits in the following table shall apply.

Table 2

Frequency	Sine-wave	Clipped sine-wave
10 Hz	75 kHz ± 3 %	75 kHz ± 10 %
10 kHz	75 kHz ± 3 %	75 kHz ± 10 %

4.2.9 Operational status

4.2.9.1 Definition

Visible indication of transmitter operation.

4.2.9.2 Method

Check indicators for accurate status.

4.2.9.3 Limit

Correct indication.

4.2.10 Spurious emissions

4.2.10.1 Definition

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

4.2.10.2 Method of measurement

The test defined in clause 5.2.9 shall be applied.

4.2.10.3 Limit

Spurious emissions shall not exceed the values set out in table 3, shown additionally in figure 1 for the frequency range 9 kHz to 1 GHz.

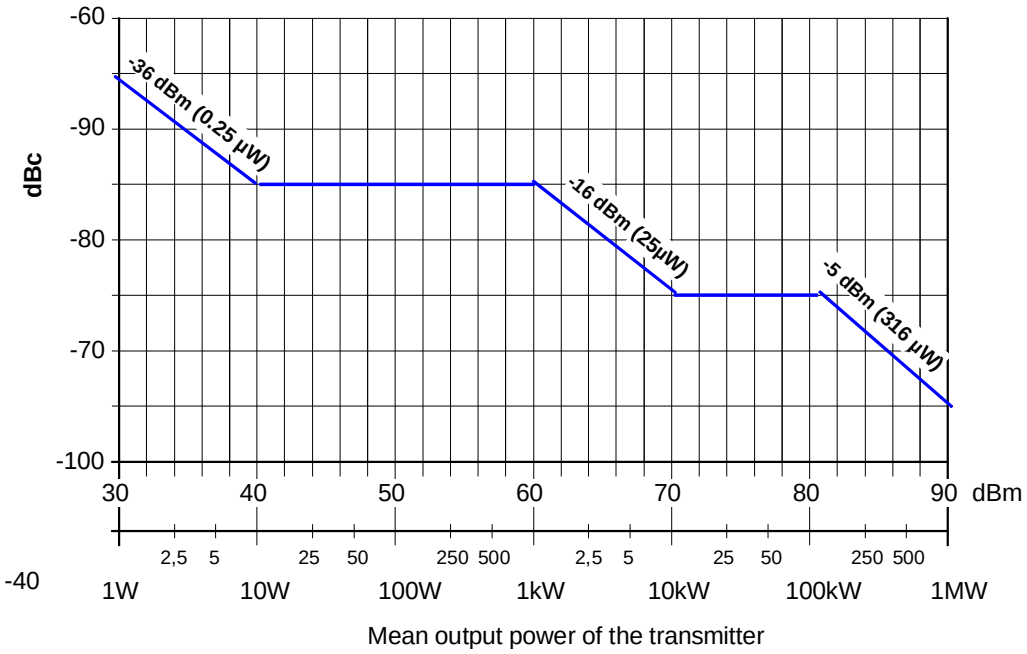

Figure 1: Spurious Emission limits for FM sound broadcasting transmitters

Table 3

Limits Mean power absolute levels (dBm) or relative levels (dBc) below the power supplied to the antenna port in the reference bandwidth	
-36 dBm	P ≤ 9 dBW
75 dBc	9 dBW < P ≤ 29 dBW
-16 dBm	29 dBW < P ≤ 39 dBW
85 dBc	39 dBW < P ≤ 50 dBW
-5 dBm	50 dBW < P
where P is the mean power of the transmitter (W)	
NOTE: Within the band 108 to 137 MHz the absolute limit of 25 µW shall apply.	

4.2.11 Out-of-band emissions

4.2.11.1 Definition

Emission on a frequency or frequencies immediately outside the necessary bandwidth, which results from the modulation process, but excludes spurious emissions.

4.2.11.2 Method of measurement

The test defined in clause 5.2.10 shall be applied.

4.2.11.3 Limit

The spectrum limit mask for VHF FM sound broadcasting is shown in figure 2. The related break points are given in table 4.

Power level is measured in a 1 kHz bandwidth.

The limits shown in figure 2 apply.

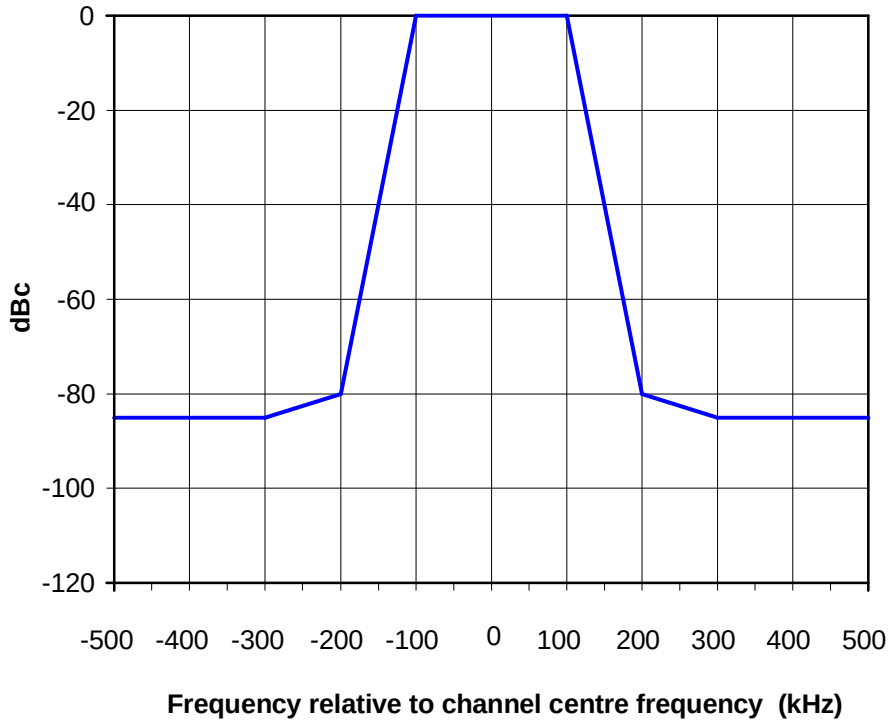

Figure 2: Out-of-Band Emission limits for FM sound broadcasting transmitters

NOTE: Within the band 108 to 137 the absolute limit of 25 µW shall apply.

Table 4

Break points of spectrum limit mask for VHF FM sound broadcasting	
Frequency relative to the centre of the channel (kHz)	**Relative level (dB)**
-500	-85
-300	-85
-200	-80
-110	0
110	0
200	-80
300	-85
500	-85

4.3 Radiated measurements

4.3.1 Cabinet radiation

4.3.1.1 Definition

Emissions from the equipment, radiated from the enclosure port, other than those present at the antenna port.

4.3.1.2 Method

The test defined in clause 5.2.11 shall be applied.

4.3.1.3 Limits

This test shall be performed at a distance of 10 m, where feasible. When size and/or power requirements necessitate testing in a manufacturing facility, other distances may be used (see notes 1, 2 and 3). Tests shall not be carried out in the exclusion band (2).

Table 5

Limits for radiated unwanted emissions	
Quasi-peak limits (dBµV/m) at 10m (1) (2)	**Frequency range**
30 dBµV/m ≤ 60 + 10 $\log_{10}$ (P0/2 000) ≤ 70 dBµV/m	30 MHz – 230 MHz
37 dBµV/m ≤ 67 + 10 $\log_{10}$ (P0/2 000) ≤ 77 dBµV/m	> 230 MHz – 1 GHz
1) P0 = RF output power in watts. 2) The exclusion band for the transmitter extends from Fc – 300 kHz to Fc + 300 kHz, where Fc is the operating frequency in MHz.	

NOTE 1: The measurements can be carried out at other distances. In that case limits are modified according to the relation:

$$L(xm) = L(10m) + 20 \log (10/x)$$

where x = distance.

NOTE 2: Care should be taken if measuring at test distances below 10 m as this may be in the near field.

NOTE 3: In cases of dispute the measurement distance of 10 m shall take precedence.

5 Testing for compliance with technical requirements

5.1 Measurement Uncertainties

Measurement uncertainty should be calculated and techniques employed to minimize its range. This uncertainty should be applied to the limit and any measurement falling below the range is deemed acceptable (ITU-R Recommendation 412-5 [3]).

5.2 Essential radio test suites

5.2.1 Rated output power

5.2.1.1 Method of test

5.2.1.1.1 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) connect the AF Signal Generator to the EUT;

2) connect the EUT to the Test Load, via the Coupling Device;

3) connect the Spectrum Analyser to the Coupling Device.

5.2.1.1.2 Procedure

1) set the AF Signal Generator to deliver a test signal as defined in annex A.3;

2) operate the EUT at each of the test frequencies as defined in clause 5.2.1.1.1;

3) measure the results on the Spectrum Analyser.

5.2.1.1.3 Test requirements

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

5.2.2 Frequency stability

Measurements should be made at intervals, which are short enough to reveal the presence of superimposed periodical variations (see annex A).

5.2.2.1 Method of test

5.2.2.1.1 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) connect the AF Signal Generator to the EUT;
2) connect the EUT to the Test Load, via the Coupling Device;
3) connect the Spectrum Analyser to the Coupling Device.

5.2.2.1.2 Procedure

1) set the AF Signal Generator to deliver a test signal as defined in annex A.3;
2) operate the EUT at each of the test frequencies as defined in clause 5.2.2.1.1;
3) measure the results on the Spectrum Analyser.

5.2.2.1.3 Test requirements

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

5.2.3 Transmitter muting during frequency shift.

5.2.3.1 Method of test

5.2.3.1.1 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) connect the AF Signal Generator to the EUT;
2) connect the EUT to the Test Load, via the Coupling Device;
3) connect the Spectrum Analyser to the Coupling Device.

5.2.3.1.2 Procedure

1) set the AF Signal Generator to deliver a test signal as defined in annex A.3;
2) operate the EUT at each of the test frequencies as defined in clause 5.2.3.1.1;
3) measure the results on the Spectrum Analyser.

5.2.3.1.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.3.3 in order to demonstrate compliance.

5.2.4 Maximum frequency deviation

A deviation meter shall be used.

5.2.4.1 Method of test

5.2.4.1.1 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) connect the AF Signal Generator to the EUT;

2) connect the EUT to the Test Load, via the Coupling Device;

3) connect the Spectrum Analyser to the Coupling Device.

5.2.4.1.2 Procedure

1) set the AF Signal Generator to deliver a test signal as defined in annex A.3;

2) operate the EUT at each of the test frequencies as defined in clause 5.2.4.1.1;

3) measure the results on the Spectrum Analyser.

5.2.4.1.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.4.3 in order to demonstrate compliance.

5.2.5 Deviation sensitivity stability

5.2.5.1 Method of test

5.2.5.1.1 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) connect the AF Signal Generator to the EUT;
2) connect the EUT to the Test Load, via the Coupling Device;
3) connect the Spectrum Analyser to the Coupling Device.

5.2.5.1.2 Procedure

1) set the AF Signal Generator to deliver a test signal as defined in annex A.3;
2) operate the EUT at each of the test frequencies as defined in clause 5.2.5.1.1;
3) measure the results on the Spectrum Analyser.

5.2.5.1.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.5.3 in order to demonstrate compliance.

5.2.6 Hum and noise

5.2.6.1 Method of test

The measurement shall be carried out in accordance with EN 60244-13 [4], clause 8.3.1.

5.2.6.1.1 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) connect the AF Signal Generator to the EUT;
2) connect the EUT to the Test Load, via the Coupling Device;
3) connect the Spectrum Analyser to the Coupling Device.

5.2.6.1.2 Procedure

1) set the AF Signal Generator to deliver a test signal as defined in annex A.3;
2) operate the EUT at each of the test frequencies as defined in clause 5.2.6.1.1;
3) measure the results on the Spectrum Analyser.

5.2.6.1.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.6.3 in order to demonstrate compliance.

5.2.7 Synchronous AM

5.2.7.1 Method of test

5.2.7.1.1 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) connect the AF Signal Generator to the EUT;

2) connect the EUT to the Test Load, via the Coupling Device;

3) connect the Spectrum Analyser to the Coupling Device.

5.2.7.1.2 Procedure

1) set the AF Signal Generator to deliver a test signal as defined in annex A.3;

2) operate the EUT at each of the test frequencies as defined in clause 5.2.7.1.1;

3) measure the results on the Spectrum Analyser.

5.2.7.1.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.7.3 in order to demonstrate compliance.

5.2.8 Modulator performance

5.2.8.1 Method of test

Two sine wave test waveforms with frequencies of 10 Hz and 10 kHz and distortion < 1 % will be required. Two further test waveforms shall be generated from these and should be symmetrically clipped by 12 dB. All four test waveforms must have identical peak levels, which shall be equal to the level declared by the manufacturer to give 75 kHz deviation.

The manufacturer may alternatively declare the performance specifications for frequency response and stereo separation, using a suitable stereo encoder.

5.2.8.1.1 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) connect the AF Signal Generator to the EUT;
2) connect the EUT to the Test Load, via the Coupling Device;
3) connect the Spectrum Analyser to the Coupling Device.

5.2.8.1.2 Procedure

1) set the AF Signal Generator to deliver a test signal as defined in annex A.3;
2) operate the EUT at each of the test frequencies as defined in clause 5.2.8.1.1;
3) measure the results on the Spectrum Analyser.

5.2.8.1.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.8.3 in order to demonstrate compliance.

5.2.9 Spurious emissions

5.2.9.1 Method of test

5.2.9.1.1 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) connect the AF Signal Generator to the EUT;
2) connect the EUT to the Test Load, via the Coupling Device;
3) connect the Spectrum Analyser to the Coupling Device.

5.2.9.1.2 Procedure

1) set the AF Signal Generator to deliver a test signal as defined in annex A.3;
2) operate the EUT at each of the test frequencies as defined in clause 5.2.9.1.1;
3) measure the results on the Spectrum Analyser.

5.2.9.1.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.10.3 in order to demonstrate compliance.

5.2.10 Out-of-band emissions

5.2.10.1 Method of test

5.2.10.1.1 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) connect the AF Signal Generator to the EUT;

2) connect the EUT to the Test Load, via the Coupling Device;

3) connect the Spectrum Analyser to the Coupling Device.

5.2.10.1.2 Procedure

1) set the AF Signal Generator to deliver a test signal as defined in annex A.3;

2) operate the EUT at each of the test frequencies as defined in clause 5.2.10.1.1;

3) measure the results on the Spectrum Analyser.

5.2.10.1.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.11.3 in order to demonstrate compliance.

5.2.11 Cabinet radiation

5.2.11.1 Method of test

5.2.11.1.1 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) connect the AF Signal Generator to the EUT;

2) connect the EUT to the Test Load;

3) connect the Spectrum Analyser to the measuring antenna.

5.2.11.1.2 Procedure

1) set the AF Signal Generator to deliver a test signal as defined in annex A.3;

2) operate the EUT at each of the test frequencies as defined in clause 5.2.11.1.1;

3) measure the results on the Spectrum Analyser;

4) testing shall be carried out at a suitably calibrated test site, unless physical size is a restriction, in which case the test method shall be in accordance with EN 55011 [5]:

   - measurements shall be made outside ± 250 % of the necessary bandwidth of the transmission;
   - measurements shall be made in the operational mode producing the largest emission in the frequency band being investigated consistent with normal applications;
   - the equipment shall be configured in a manner which is representative of a normal/typical operation, where practical;
   - an attempt shall be made to maximize the detected radiated emission, e.g. by moving the cables of the equipment;
   - the configuration and mode of operation during measurements shall be precisely noted in the test report;
   - RF input/output ports shall be correctly terminated;
   - the tests shall be carried out at a point within the specified normal operating environmental range and at the rated supply voltage for the equipment.

5.2.11.1.3 Test requirements

The results obtained shall be compared to the limits in clause 4.3.1.3 in order to demonstrate compliance.

Annex A (normative): Typical measuring arrangements

A.1 Reference bandwidth

The reference bandwidth used for antenna port measurements should be 100 Hz.

A.2 Testing arrangements for antenna port measurements

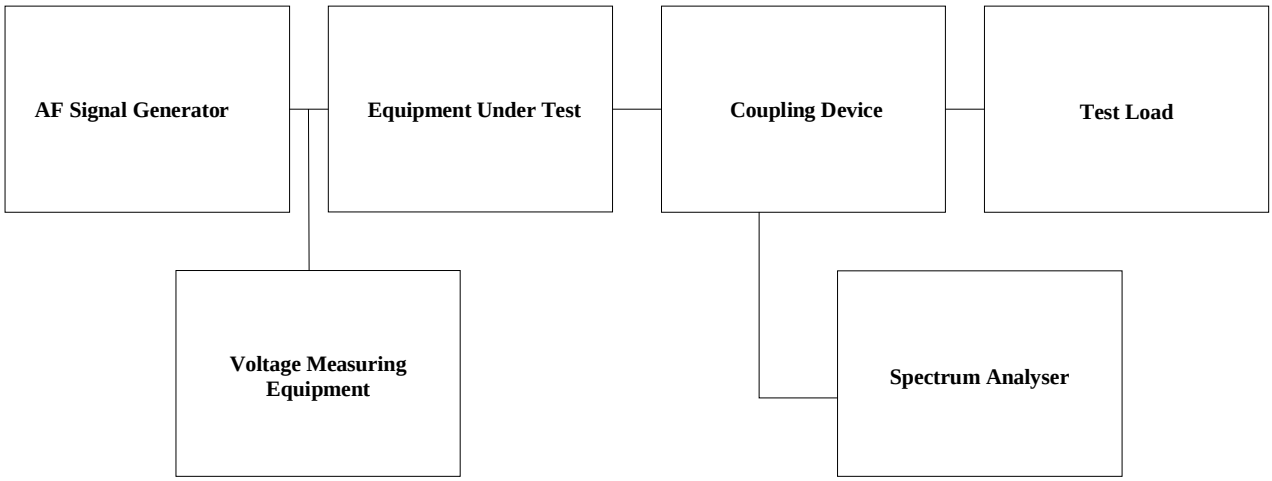

Figure A.1

A.3 Test modulating signal

A Modulating signal sufficient to achieve Maximum modulation as declared by the manufacturer.

Annex B (informative): Bibliography

- EN 302 018-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Transmitting equipment for the Frequency Modulated (FM) radio broadcast service; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive".
- 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 analogue terrestrial sound broadcasting (Amplitude Modulation (AM) and Frequency Modulation (FM)) service transmitters".
- Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive).
- Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (LV Directive).
- International Telecommunication Union (ITU) Radio regulations Edition of 1998.
- ERC Recommendation 74-01: "Spurious emissions".
- ITU-R Recommendation BS.450-1 (1982): "Transmission standards for FM sound broadcasting at VHF".
- EN 60244-1: "Methods of measurements for radio transmitters - Part 1: General characteristics for broadcast transmitters".
- IEC 60244-2 (1969-01): "Methods of measurement for radio transmitters. Part 2: Bandwidth, out-of-band power and power of non-essential oscillations".
- ITU-R Recommendation BS.468-4 (1986): "Measurement of audio frequency noise voltage levels in sound broadcasting".
- ETSI ETR 132: "Radio broadcasting systems; Code of practice for site engineering Very High Frequency (VHF), frequency modulated, sound broadcasting transmitters".
- ETSI TR 100 028 (all parts): "ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- ITU-R Recommendation SM 329-8 (2000): "Spurious emissions".

History

Document history			
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