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Transmitting equipment for the Digital Radio Mondiale (DRM) sound broadcasting service; Harmonised Standard for access to radio spectrum

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Foreword

This draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the combined Public Enquiry and Vote phase of the ETSI standards EN Approval Procedure.

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.4] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.1].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A.1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

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):	18 months after doa

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Introduction

The present document describes the requirements for the design and operation of an DRM sound broadcasting service transmitter.

1 Scope

The present document specifies technical characteristics and methods of measurements for transmitting equipment for the Digital Radio Mondiale (DRM) sound broadcasting service operating in the LF band, MF band, HF band and VHF band.

NOTE: The relationship between the present document and essential requirements of article 3.2 of Directive 2014/53/EU [i.1] is given in annex A.

2 References

2.1 Normative references

References are specific, identified by date of publication and/or edition number or version number. Only the cited version applies.

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

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

[1] ETSI ES 201 980 (V4.1.2) (04-2017): "Digital Radio Mondiale (DRM); System specification".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC.

[i.2] ETSI TR 100 028 (all parts) (V1.4.1) (12-2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

[i.3] ETSI TR 100 028-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".

[i.4] Commission Implementing Decision C(2015) 5376 final of 4.8.2015 on a standardisation request to the European Committee for Electrotechnical Standardisation and to the European Telecommunications Standards Institute as regards radio equipment in support of Directive 2014/53/EU of the European Parliament and of the Council.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in Directive 2014/53/EU [i.1] and the following 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.

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.

DRM transmitter: device comprising a DRM exciter, RF amplifier and RF system filter

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.

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: Second 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

RF system filter: filter connected to the output of the RF amplifier to control output spectrum

NOTE: The RF system filter may be internal or external to the transmitter casing.

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 × (Irms Δ cos φ)

Where Δ cos φ is the phase difference between voltage and current introduced by the reactance of the load.

NOTE 2: From note 1 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 symbols apply:

μ	micro, 10^{-6}

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
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 technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the manufacturer. The equipment shall comply with all the technical requirements of the present document which are identified as applicable in annex A at all times when operating within the boundary limits of the declared operational environmental profile.

4.2 Conformance requirements

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 Limit

The mean output power shall be the rated output power under normal operating conditions as defined by the manufacturer.

4.2.1.3 Conformance

Conformance tests as defined in clause 5.3.1 shall be carried out.

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 Limit

4.2.2.2.1 DRM transmitters operating below 30 MHz

For a period of not less than ninety days, the frequency of the transmitter shall stay within the tolerance of ±10 Hz.

4.2.2.2.2 DRM transmitters operating between 30 MHz and 300 MHz

For a period of not less than ninety days, the frequency of the transmitter shall stay within the tolerance of ±100 Hz.

4.2.2.3 Conformance

Conformance tests as defined in clause 5.3.2 shall be carried out.

4.2.3 Spurious emissions

4.2.3.1 Definition

Emission on a frequency or on 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.

For the purposes of the present document spurious emissions are emissions at frequencies outside 500 % of the necessary bandwidth.

4.2.3.2 Limit

4.2.3.2.1 DRM transmitters operating below 30 MHz

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

Table 1: Spurious emission limits for DRM transmitters operating below 30 MHz

Mean power of the transmitter	**Limits Mean power absolute levels (dBm) or relative levels (dBc) below the mean power supplied to the antenna port in the reference bandwidth (see clause B.1.2)**
All power ranges	-50 dBc, without exceeding the absolute mean power of 50 mW (17 dBm)

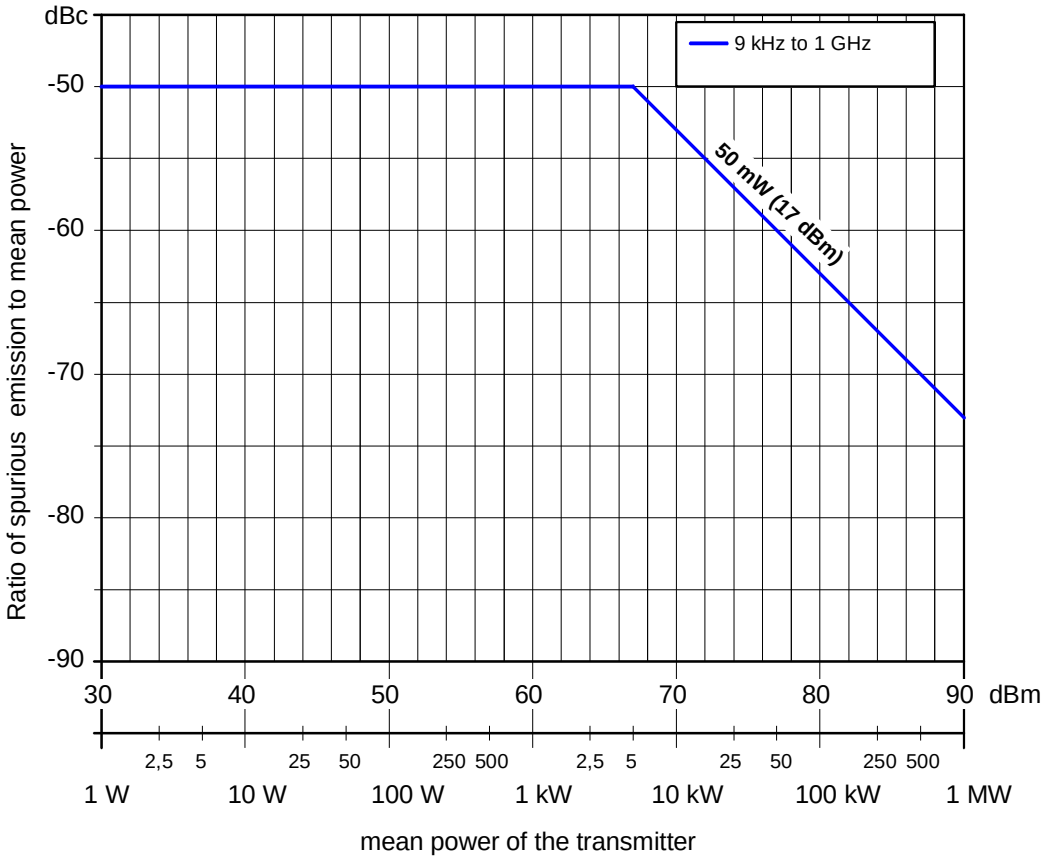


Figure 1: Spurious emission limits for DRM transmitters operating below 30 MHz

4.2.3.2.2 DRM transmitters operating between 30 MHz and 300 MHz

For DRM transmitters operating between 30 MHz and 300 MHz, spurious emissions shall not exceed the values set out in table 2 and additionally as shown in figure 2 for the frequency range 9 kHz to 1 GHz.

Table 2: Spurious emission limits for DRM transmitters operating between 30 MHz and 300 MHz

Mean power of the transmitter	Limits Mean power absolute levels (dBm) or relative levels (dBc) below the power supplied to the antenna port in the reference bandwidth (see clause B.1.2)
P < 9 dBW	-36 dBm
9 dBW ≤ P < 29 dBW	75 dBc
29 dBW ≤ P < 39 dBW	-16 dBm
39 dBW ≤ P < 50 dBW	85 dBc
50 dBW ≤ P	-5 dBm
NOTE: Within the band 108 MHz to 137 MHz the limits apply without exceeding the absolute limit of 25 µW (-16 dBm).	

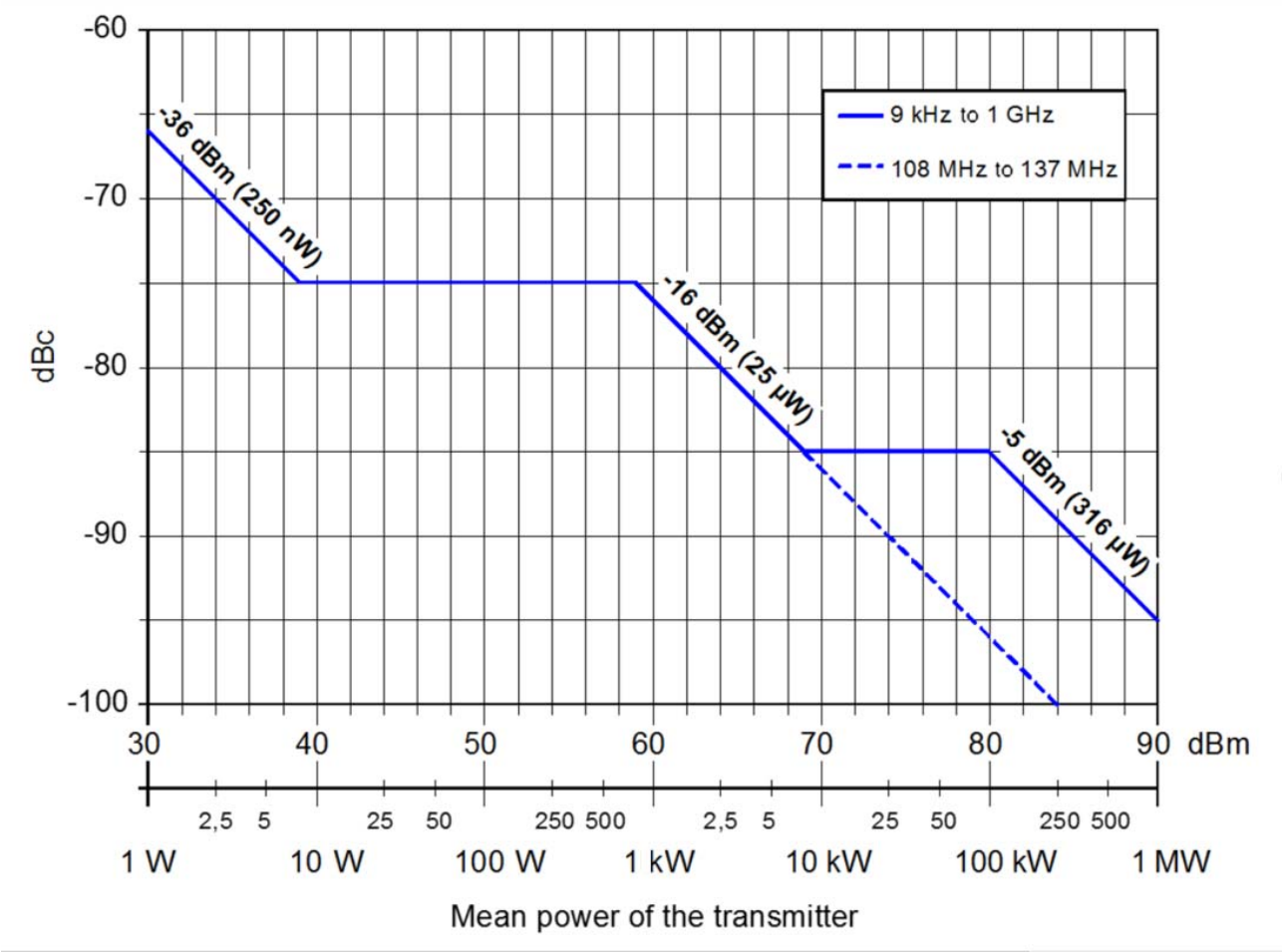


Figure 2: Spurious emission limits for DRM transmitters operating between 30 MHz and 300 MHz

4.2.3.3 Conformance

Conformance tests as defined in clause 5.3.3 shall be carried out.

4.2.4 Transmitter muting during frequency shift

4.2.4.1 Definition

The suppression of emissions during the re-tuning of transmitters.

4.2.4.2 Limits

The muting shall be as defined in clause 4.2.3.2.

4.2.4.3 Conformance

Conformance tests as defined in clause 5.3.4 shall be carried out.

4.2.5 Out-of-band emissions

4.2.5.1 Definition

Out-of-band emissions are defined as any emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions.

For the purposes of the present document the out-of-band region shall extend to ±500 % of the necessary bandwidth.

4.2.5.2 Limit

4.2.5.2.1 DRM transmitters operating below 30 MHz

Out of band emissions shall not exceed the values set out in table 3. Additionally, the limits are shown in figure 3 on a logarithmic frequency axis and in figure 4 on a linear axis.

Relationship between the 0 dB reference level and the carrier level:

- The reference level 0 dB corresponds to power density that would exist if the total RF power, excluding the power of the carrier, were distributed uniformly over the necessary bandwidth.

The ratio α_B (dB) of 0 dB reference level to the carrier is given by the equation:

$$\alpha_B = 10\log\frac{m_{rms}^2}{2}\frac{B_{eff}}{F}$$

where: m_{rms} = r.m.s modulation factor of the transmitter

B_{eff} = effective noise bandwidth of the analyser

F = necessary bandwidth for the emission

Hence the reference level depends on the power of the sideband P_s, given by the formula:

$$P_s = \frac{m_{rms}^2}{2}P_c$$

where: P_c = carrier power

If frequency is plotted as the abscissa in logarithmic units and if the power densities are plotted as ordinates (dB) the curve representing the out-of-band spectrum should lie below two straight lines starting at point (0,5 *F*; 0 dB) or at point (-0,5 *F*; 0 dB) and finishing at point (0,7 *F*; -35 dB) or (-0,7 *F*; -35 dB) respectively. Beyond these points and down to the level of -60 dB, this curve should lie below two straight lines starting from the latter points and having a slope of 12 dB/octave. Thereafter, the same curve should lie below the level -60 dB. The ordinate of the curve so defined represents the average power intercepted by an analyser with an rms noise bandwidth of 100 Hz, the frequency of which is tuned to the frequency plotted on the abscissa.

Table 3: Out-of-band emission limits for DRM transmitters operating below 30 MHz

Relative Frequency (f/F)	Frequency difference (f) from the centre frequency at different channel bandwidths (F) (kHz)				Relative level (dB)
	F = 4,5	F = 5	F = 9	F = 10	
±0,1	0,45	0,5	0,9	1	0
±0,5	2,25	2,5	4,5	5	0
±0,7	3,15	3,50	6,3	7	-35
±1,4	6,3	7	12,6	14	-47
±2,8	12,6	14	25,2	28	-59
≥ ±2,952	13,28	14,76	26,57	29,52	-60

NOTE: Figure 3 is only an additional representation of the limits given in table 3. It is not representative of the output of a spectrum analyser. The slope outside ±0,7 × F is 12 dB per octave until the value of -60 dB is reached.

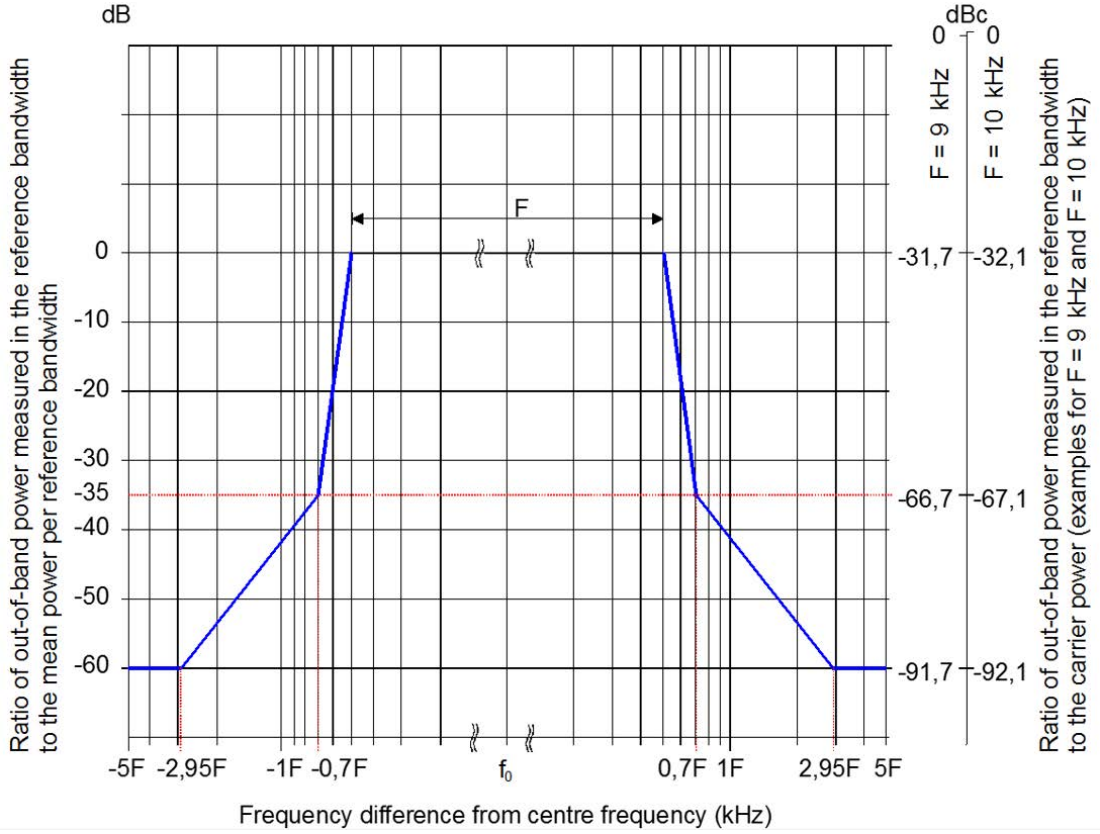


Figure 3: Out of band emission limits for DRM transmitters operating below 30 MHz shown on a logarithmic axis

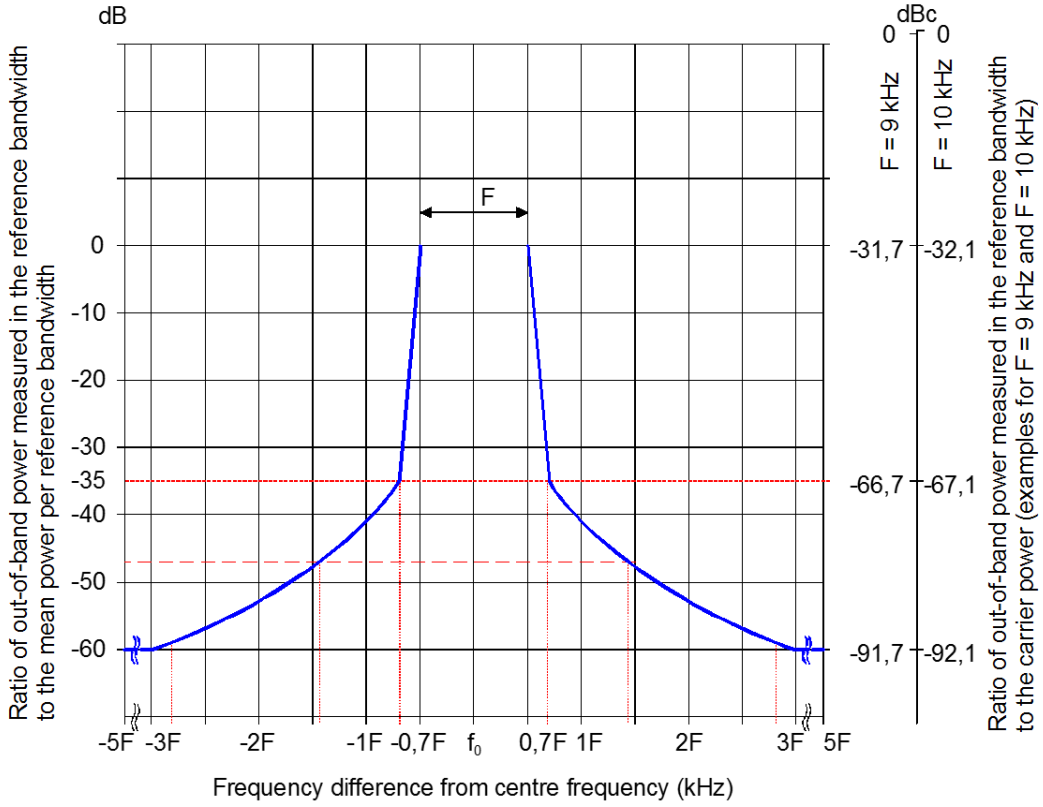


Figure 4: Out of band emission limits for DRM transmitters operating below 30 MHz shown on a linear axis

4.2.5.2.2 DRM transmitters operating between 30 MHz and 300 MHz

Out of band emissions shall not exceed the values set out in table 4 and additionally as shown in figure 5.

Table 4: Break points of spectrum limit mask for DRM transmitters operating between 30 MHz and 300 MHz

Frequency relative to the centre of the channel (kHz)	Relative level (dBc)
-500	-65
-300	-65
-200	-60
-100	-50
-70	-30
-50	0
50	0
70	-30
100	-50
200	-60
300	-65
500	-65

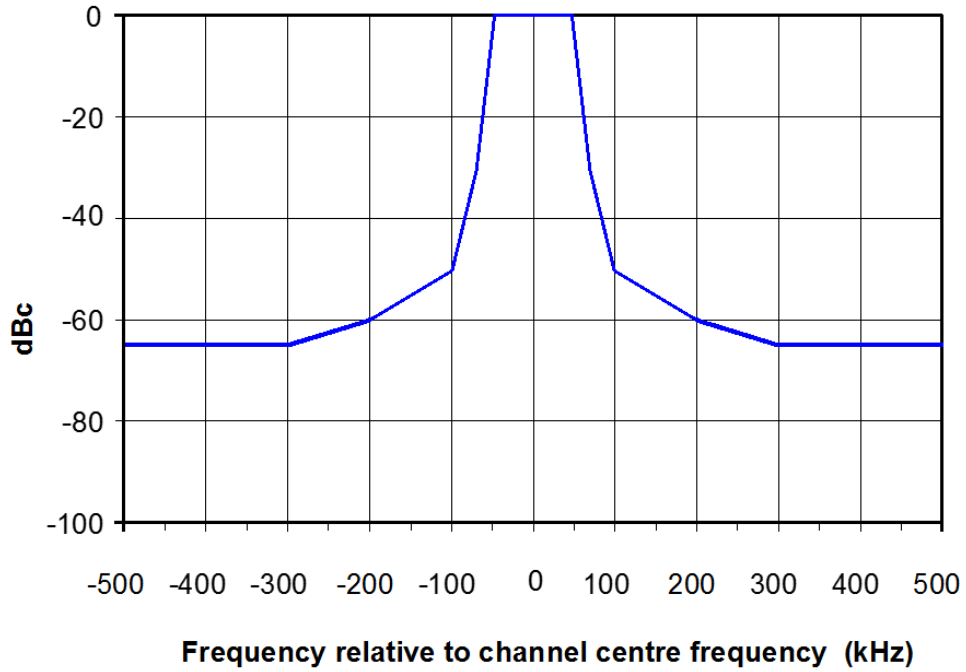


Figure 5: Out-of-band emission limits for DRM transmitters operating between 30 MHz and 300 MHz

4.2.5.3 Conformance

Conformance tests as defined in clause 5.3.5 shall be carried out.

4.2.6 Modulation Error Ratio (MER)

4.2.6.1 Definition

MER is a single parameter to measure the quality of the transmitted signal. It is defined as the sum of the squares of the magnitudes of the ideal symbol vectors divided by the sum of the squares of the magnitudes of the symbol error vectors. The result is expressed as a power ratio in dB.

4.2.6.2 Limit

4.2.6.2.1 DRM transmitters operating below 30 MHz

The result shall be not less than 30 dB.

4.2.6.2.2 DRM transmitters operating between 30 MHz and 300 MHz

The result shall be not less than 21 dB.

4.2.6.3 Conformance

Conformance tests as defined in clause 5.3.6 shall be carried out.

5 Testing for compliance with technical requirements

5.1 Environmental conditions for testing

Tests defined in the present document shall be carried out at representative points within the boundary limits of the declared operational environmental profile.

Where technical performance varies subject to environmental conditions, tests shall be carried out under a sufficient variety of environmental conditions (within the boundary limits of the declared operational environmental profile) to give confidence of compliance for the affected technical requirements.

5.2 Interpretation of the measurement results

The interpretation of the results recorded in a test report for the measurements described in the present document shall be as follows:

- the measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements of the present document;
- the value of the measurement uncertainty for the measurement of each parameter shall be included in the test report;
- the recorded value of the measurement uncertainty shall be, for each measurement, equal to or less than the figures in table 5.

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated and shall correspond to an expansion factor (coverage factor) k = 1,96 or k = 2 (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)). Principles for the calculation of measurement uncertainty are contained in ETSI TR 100 028 [i.2], in particular in annex D of ETSI TR 100 028-2 [i.3].

Table 5 is based on such expansion factors.

Table 5: Maximum measurement uncertainty

Parameter	Uncertainty
Rated power output (conducted)	0,75 dB
Frequency drift	0,1 Hz
Spurious emissions (conducted emissions)	3,0 dB
Transmitter muting during frequency shift (conducted emissions)	3,0 dB
Out-of-band emissions (conducted emissions)	3,0 dB
Modulation Error Ratio	0,75 dB

5.3 Methods of measurement

5.3.1 Rated output power

5.3.1.1 Method of measurement

5.3.1.1.1 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 B.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.

5.3.1.1.2 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.

5.3.1.1.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.1.2 in order to demonstrate compliance.

5.3.2 Frequency stability

5.3.2.1 Method of measurement

5.3.2.1.1 Initial conditions

Test environment:

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

Test frequency:

- any one frequency within the tuning range of the EUT.

Test arrangement (see figure B.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.

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

5.3.2.1.2 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 of the frequency stability specified in clause 4.2.2.2.

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.

Other methods of great precision use a standard reference frequency, the frequency of which is known with high accuracy. With such methods, the reception of a standard frequency transmission may be used to advantage. When the frequency is to be measured as a function of time, measurements shall be made at intervals, which are short enough to reveal the presence of superimposed periodical variations.

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

The accuracy of the measuring method shall be stated with the results of the measurements.

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

5.3.2.1.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.2.2 in order to demonstrate compliance.

5.3.3 Spurious emissions

5.3.3.1 Method of measurement

5.3.3.1.1 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 B.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;

3) connect the measuring device to the coupling device (a filter may be used to attenuate the wanted signal).

5.3.3.1.2 Procedure

1) terminate the input of the transmitter as specified by the manufacturer;

2) operate the EUT at each of the test frequencies as defined in clause 5.3.3.1.1;

3) measure the results on the spectrum analyser.

5.3.3.1.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.3.2 in order to demonstrate compliance.

5.3.4 Transmitter muting during frequency shift

5.3.4.1 Method of measurement

5.3.4.1.1 Initial conditions

Test environment:

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

Test frequencies:

- present frequency to desired frequency.

Test arrangement (see figure B.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;
3) connect the measuring device to the coupling device.

5.3.4.1.2 Procedure

1) operate the EUT at the present frequency;
2) initiate frequency change;
3) observe the output signal on an oscilloscope.

5.3.4.1.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.4.2 in order to demonstrate compliance.

5.3.5 Out-of-band emissions

5.3.5.1 Method of measurement

5.3.5.1.1 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 B.1).

5.3.5.1.2 Procedure

1) all ports unused at the time of testing shall be correctly terminated;
2) operate the EUT at each of the test frequencies as defined in clause 5.3.5.1.1;
3) measure the results on the Spectrum Analyser.

5.3.5.1.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.5.2 in order to demonstrate compliance.

5.3.6 Modulation Error Ratio (MER)

5.3.6.1 Method of measurement

The carrier frequency of the OFDM signal and the symbol timing are recovered by the receiver. In the received signal Origin Offset (e.g. caused by residual carrier or DC offset in the mixers), Quadrature Error (e.g. caused by phase shift between the I and Q signal) and Amplitude Imbalance (e.g. caused by different amplification of I and Q) are not corrected in the receiver.

A time record of N received symbol co-ordinate pairs (I_j, Q_j) is captured.

For each received symbol, a decision is made as to which symbol was transmitted. The error vector is defined as the distance from the ideal position of the chosen symbol (the centre of the decision box) to the actual position of the received symbol.

This distance can be expressed as a vector (δI_j, δQ_j).

$$MER = 10 \times \log_{10} \left\{ \frac{\sum_{j=1}^{N} \left(I_j^2 + Q_j^2 \right)}{\sum_{j=1}^{N} \left(\delta I_j^2 + \delta Q_j^2 \right)} \right\} dB$$

Measurements are taken at the transmitter output using the set-up shown in figure B.1.

The measurement should be determined with the use of a receiver with the lowest possible noise factor in order to avoid causing measurement error. This receiver should be able to demodulate a clean DRM signal and should have a MER, that is at least 10 dB higher than the limit stated in clause 4.2.6.2.

Operate the transmitter at its nominal output power. Measure the MER for the different modulation modes (64-QAM, 16-QAM, 4-QAM as appropriate).

Measurements are taken on all the carriers with an integration period taking into account the average value over 100 OFDM symbols.

The result will be presented in a table or graphs for the different modulation modes.

Annex A (informative): Relationship between the present document and the essential requirements of Directive 2014/53/EU

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.4] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.1].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A.1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table A.1: Relationship between the present document and the essential requirements of Directive 2014/53/EU

Harmonised Standard ETSI EN 302 245					
Requirement				Requirement Conditionality	
No	Description	Essential requirements of Directive	Clause(s) of the present document	U/C	Condition
1	Rated output power	3.2	4.2.1	U	
2	Frequency drift	3.2	4.2.2	U	
3	Spurious emissions	3.2	4.2.3	U	
4	Transmitter muting during frequency shift	3.2	4.2.4	U	
5	Out-of-band emissions	3.2	4.2.5	U	
6	MER	3.2	4.2.6	U	

Key to columns:

Requirement:

No A unique identifier for one row of the table which may be used to identify a requirement.

Description A textual reference to the requirement.

Essential requirements of Directive

Identification of article(s) defining the requirement in the Directive.

Clause(s) of the present document

Identification of clause(s) defining the requirement in the present document unless another document is referenced explicitly.

Requirement Conditionality:

U/C Indicates whether the requirement is unconditionally applicable (U) or is conditional upon the manufacturer's claimed functionality of the equipment (C).

Condition Explains the conditions when the requirement is or is not applicable for a requirement which is classified "conditional".

Presumption of conformity stays valid only as long as a reference to the present document is maintained in the list published in the Official Journal of the European Union. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union.

Other Union legislation may be applicable to the product(s) falling within the scope of the present document.

Annex B (normative): Typical measuring arrangements

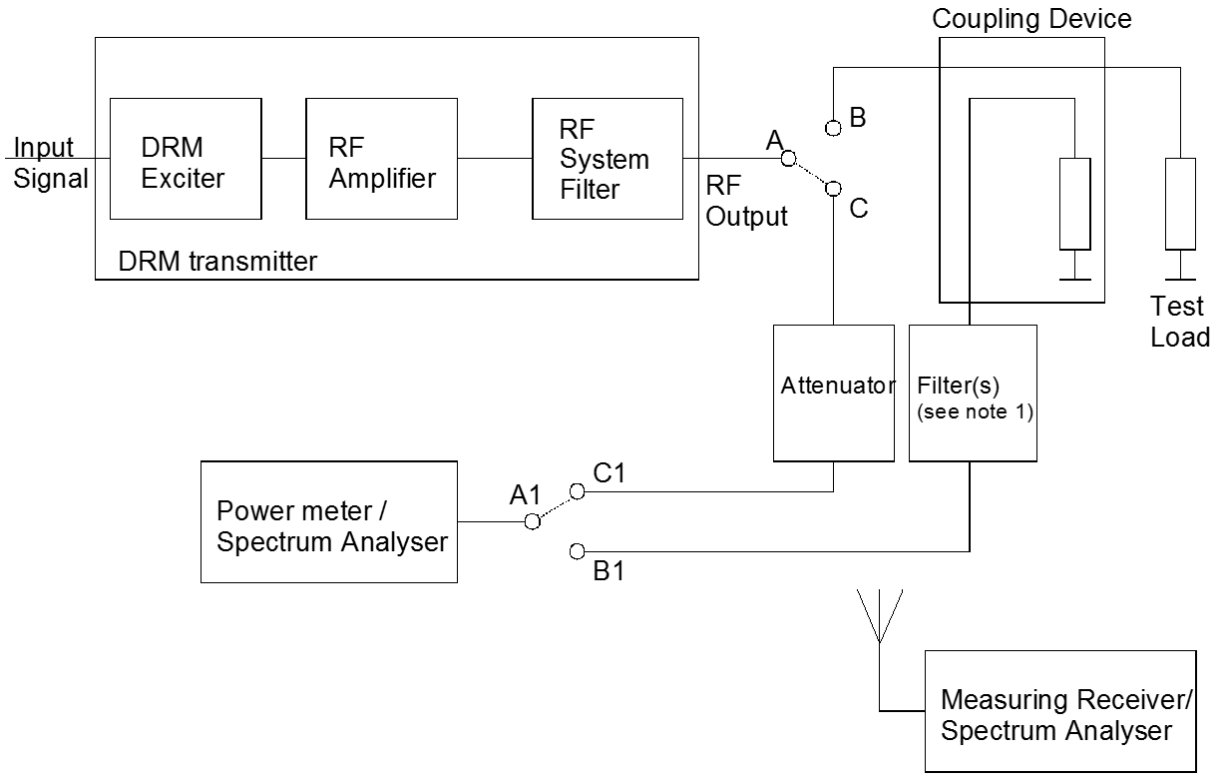
B.1 Testing arrangements for antenna port (and MER) measurements

B.1.0 General

The optional filter should suppress the output signal so that no intermodulation products are generated by the spectrum analyser. The insertion loss throughout the measuring range should be known.

For MER measurements substitute DRM receiver and MER measuring device for "Power meter/Spectrum Analyser".

B.1.1 Testing arrangement



NOTE 1: Filter(s) not used in Rated output power measurements.
The optional filter should suppress the output signal so that no intermodulation products are generated by the spectrum analyser. The insertion loss throughout the measuring range should be known.
NOTE 2: For high power transmitters the preferred set up would require A to be connected to B and A1 to be connected to B1.
NOTE 3: For low power transmitters the preferred set up would require A to be connected to C and A1 to be connected to C1.

Figure B.1: Testing arrangement for antenna port (and MER) measurements

B.1.2 Test frequency range (antenna port measurements)

Limits on unwanted emissions for radio equipment are considered to be applicable to the range 9 kHz to 300 GHz. However, for practical measurement purposes, the frequency range of spurious emissions may be restricted. As guidance for practical purposes, the following measurement parameters in table B.1 are recommended:

Table B.1: Antenna port measurements

Transmitter fundamental frequency range	Unwanted emission frequency measurement range	
	Lower frequency	Upper frequency
9 kHz to 300 MHz	9 kHz	1 GHz

The following reference bandwidths are to be used:

For spurious emissions:

- 1 kHz between 9 kHz and 150 kHz;
- 10 kHz between 150 kHz and 30 MHz;
- 100 kHz between 30 MHz and 1 GHz.

For out-of-band emissions:

- 100 Hz below 30 MHz;
- 1 kHz between 30 MHz and 300 MHz.

B.1.3 Test modulating signal

No special test signal is required, however an input signal should be provided, according to the specification of the transmitter, to obtain a valid DRM output signal as defined in ETSI ES 201 980 [1].

B.2 Test load characteristics

The transmitter may be required to operate into a precision load with return loss of >26 dB in the frequency band in which the transmitter is designed to operate.

Annex C (informative): Change history

Version	Information about changes
2.1.1	First published version covering Directive 2014/53/EU. Major changes are: • Addition of provisions for transmitters operating between 30 MHz and 300 MHz.

History

Document history		
V1.1.1	January 2005	Publication as ETSI EN 302 245 parts 1 and 2
V2.1.0	February 2018	EN Approval Procedure AP 20180517: 2018-02-16 to 2018-05-17