



**Transmitting equipment for the  
Amplitude Modulated (AM) sound broadcasting service;  
Harmonised Standard covering the essential requirements  
of article 3.2 of Directive 2014/53/EU**

*iTeh STANDARDS PREVIEW  
(standards.iteh.ai)  
Full name: Standards/etsi/302017-2016-12-04  
https://standards.iteh.ai/catalog/standards/si/302017-2016-12-04/49be-bbba-be590f6dd185/etsi-302017-2016-12-04*

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Reference

REN/ERM-TG17-14

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Keywords

AM, audio, broadcasting, harmonised standard,  
radio, regulation, terrestrial, transmitter

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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

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## Modal verbs terminology

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## Introduction

The present document describes the requirements for the design and operation of an AM sound broadcasting service transmitter to meet the essential requirements of article 3.2 of Directive 2014/53/EU [i.1].

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# 1 Scope

The present document specifies technical characteristics and methods of measurements for transmitter equipment for broadcast sound services using the Double Side Band amplitude modulated sound broadcasting service operating in the LF, MF and HF bands.

The present document covers the essential requirements of article 3.2 of Directive 2014/53/EU [i.1] under the conditions identified in annex A.

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## 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.

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

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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 100 028-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1".
- [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:

**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.

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

**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, 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.

**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 (second harmonic =  $2 \times$  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 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

**necessary bandwidth:** for a given class of emission, 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

**reference bandwidth:** bandwidth in which the spurious 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

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:

$\Omega$	ohms (unit of resistance)
$\mu$	micro, $10^{-6}$

## 3.3 Abbreviations

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

AF	Audio Frequency
AM	Amplitude Modulation
dB	decibel, logarithmic ratio (tenths of a "Bel")
dBm	dB relative to one milliwatt
EUT	Equipment Under Test
HF	High Frequency
LF	Low Frequency
MF	Medium Frequency
RF	Radio Frequency
V	Volt

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# 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 carrier power that the transmitter or transposer shall deliver at its antenna port under manufacturers specified conditions of operation.

#### 4.2.1.2 Limit

The carrier output power shall be within  $\pm 1,0$  dB of 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 drift

#### 4.2.2.1 Definition

The uncontrolled continuous and irreversible variation of frequency against a predetermined time scale.



#### 4.2.2.2 Limit

For a period of not less than ninety days, the frequency of the transmitter shall stay within the tolerance of  $\pm 10$  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

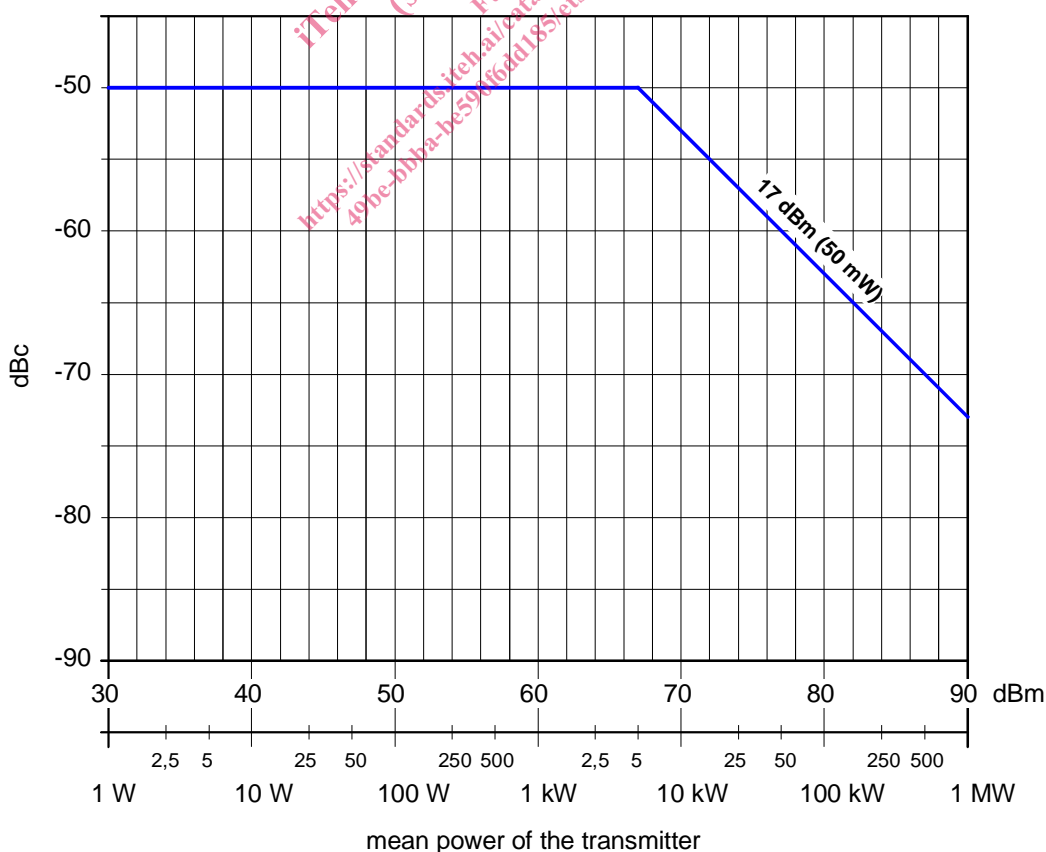
Emission on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out of band emissions.

#### 4.2.3.2 Limit

Spurious emissions shall not exceed the values set out in table 4.1, additionally shown in figure 4.1, for the frequency range 9 kHz to 1 GHz.

**Table 4.1: Spurious emission limits**

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 annex B)
All power ranges	-50 dBc, without exceeding the absolute mean power of 50 mW (17 dBm)



**Figure 4.1: Spurious emission limits**

### 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

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

### 4.2.5.2 Limit

Out of band emissions shall not exceed the values set out in table 4.2. Additionally, the limits are shown in figure 4.2 on a logarithmic frequency axis and in figure 4.3 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  $\alpha_B$  (dB) of 0 dB reference level to the carrier is given by the equation:

$$\alpha_B = 10 \log \frac{m_{rms}^2 B_{eff}}{2 F} \quad \text{where:} \quad m_{rms} = \text{r.m.s modulation factor of the transmitter}$$

$B_{eff}$  = 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:

$$P_s = \frac{m_{rms}^2}{2} P_c \quad \text{where:} \quad P_c = \text{carrier power}$$

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  $(0,5 F; 0 \text{ dB})$  or at point  $(-0,5 F; 0 \text{ dB})$  and finishing at point  $(0,7 F; -35 \text{ dB})$  or  $(-0,7 F; -35 \text{ dB})$  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.