

Final draft **ETSI EN 303 345** V1.1.7 (2017-03)



**Broadcast Sound Receivers;  
Harmonised Standard covering the essential requirements  
of article 3.2 of Directive 2014/53/EU**

*Standard Preview*  
*(standard preview)*  
*Full standard available at: <https://standards.iteh.ai/catalog/standards/sis/etsi-en-303-345-v1-1-17-07>*  
*4c2d-9fd3-162e882d01d3/etsi-en-303-345-v1-1-17-07*

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**Reference**

DEN/ERM-TG17-15

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## Foreword

This final 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 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.9] 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.

<b>Proposed national transposition dates</b>	
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
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## 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).

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## Introduction

The present document describes the requirements for radio broadcast receivers 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 devices, including the supplied antenna, that receive broadcast sound services, whether analogue or digital modulation is used. Multi-function devices may also fall under the requirements of other documents.

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.

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 EN 300 401 (V2.1.1) (01-2017): "Radio Broadcasting Systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers".
- [2] ETSI ES 201 980 (V4.1.1) (01-2014): "Digital Radio Mondiale (DRM); System Specification".
- [3] CENELEC EN 55032:2015: "Electromagnetic compatibility of multimedia equipment - Emission Requirements".
- [4] IEC 60315-1 (1988): "Methods of measurement on radio receivers for various classes of emission—Part 1: General considerations and methods of measurement, including audio-frequency measurements".
- [5] Recommendation ITU-R BS.559-2 (06/1990): "Objective measurement of radio-frequency protection ratios in LF, MF and HF broadcasting".
- [6] Recommendation ITU-R BS.468-4 (07/1986): "Measurement of audio-frequency noise voltage level in sound broadcasting".

### 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): "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] ECA table.
- NOTE: Available at [www.efis.dk](http://www.efis.dk).
- [i.5] Recommendation ITU-R BS.1615-1: "Planning parameters for digital sound broadcasting at frequencies below 30 MHz".
- [i.6] Recommendation ITU-R BS.641: "Determination of radio-frequency protection ratios for frequency-modulated sound broadcasting".
- [i.7] CEPT/ERC/Recommendation 74-01E (2011): "Unwanted emissions in the spurious domain".
- [i.8] CISPR 35: "Electromagnetic Compatibility of Multimedia equipment - Immunity Requirements".
- [i.9] 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.

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## 3 Definitions 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:

**adjacent channel selectivity:** at a given frequency separation, ratio of the maximum unwanted signal level to the wanted signal level necessary to provide a given level of audio quality

**blocking:** at a given frequency separation, ratio of the maximum AM unwanted signal level to the wanted signal level necessary to provide a given level of audio quality

**built-in antenna:** antenna that cannot be detached from the equipment

**dBm:** decibels relative to 1 mW of power

**dBQ:** audio decibels after Recommendation ITU-R BS.468-4 [6] noise weighting and a quasi-peak detector have been applied

**dB $\mu$ V:** decibels relative to 1  $\mu$ V

**dB $\mu$ V/m:** decibels relative to 1  $\mu$ V/m

**external antenna:** antenna designed to be connected to the equipment with the use of a 50  $\Omega$  or 75  $\Omega$  external connector

**integral antenna:** antenna which is detachable from the equipment without the use of any tools, and not using a 50  $\Omega$  or 75  $\Omega$  external connector

NOTE: A device that uses a supplied earphone as the antenna has an integral antenna.

**sensitivity:** minimum wanted signal level required to provide a given level of audio quality

### 3.2 Abbreviations

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

AAC	Advanced Audio Coding
ACS	Adjacent Channel Selectivity

AM	Amplitude Modulation
AMSS	Amplitude Modulation Signalling System
BS	Broadcast service (Sound)
CISPR	Comité International Spécial des Perturbations Radioélectriques
CMAD	Common Mode Absorption Device
DAB	Digital Audio Broadcasting
DRM	Digital Radio Mondiale
ECA	European Common Allocation
EEP	Equal Error Protection
EEP-3A	Equal Error Protection profile 3A
EFTA	European Free Trade Area
FAR	Fully Anechoic Room
FM	Frequency Modulation
GTEM	Gigahertz Transverse ElectroMagnetic
HF	High Frequency
ITU-R	International Telecommunications Union - Radiocommunications
LF	Low Frequency
MF	Medium Frequency
MSC	Main Service Channel
PC	Personal Computer
RDS	Radio Data System
RF	Radio Frequency
RM	Robustness Mode
RMS	Root Mean Square
SAC	Semi Anechoic Chamber
SNR	Signal to Noise Ratio
UI	User Interface
VHF	Very High Frequency

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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 Broadcast radio modulation methods

The following broadcast radio modulation methods are considered feasible within the current authorization regime in Europe:

- Amplitude modulation, with or without AMSS (AM).
- Frequency modulation, with or without RDS (FM).
- Digital Audio Broadcasting (DAB).
- Digital Radio Mondiale (DRM).

Broadcast radio receivers may include demodulation capability for one or more of these modulation methods. Conformance shall only be required for each of the modulation methods included in the receiver.



## 4.2.2 Broadcast radio frequency bands

The following frequency bands are identified in the ECA table [i.4] for broadcast radio services:

- Low frequency (LF): 148,5 kHz to 283,5 kHz.
- Medium frequency (MF): 526,5 kHz to 1 606,5 kHz.
- High Frequency (HF): 3 950 kHz to 4 000 kHz, 5 900 kHz to 6 200 kHz, 7 200 kHz to 7 450 kHz, 9 400 kHz to 9 900 kHz, 11 600 kHz to 12 100 kHz, 13 570 kHz to 13 870 kHz, 15 100 kHz to 15 800 kHz, 17 480 kHz to 17 900 kHz, 18 900 kHz to 19 020 kHz, 21 450 kHz to 21 850 kHz and 25 670 kHz to 26 100 kHz.
- VHF band I: 47 MHz to 68 MHz.
- VHF band II: 87,5 MHz to 108 MHz.
- VHF band III: 174 MHz to 240 MHz.

Broadcast radio receivers may include tuning capability for one or more of these frequency bands. Conformance shall only be required for each of the frequency bands included in the receiver.

## 4.2.3 Test signal configurations

### 4.2.3.1 AM testing

The generated AM signals (wanted, unwanted and blocking) shall be in accordance with table 1. The configuration is based on Recommendation ITU-R BS.1615-1 [i.5].

**Table 1: AM configuration**

Parameter	AM signals		
	<i>Wanted</i>	<i>Unwanted</i>	<i>Blocking</i>
<b>Audio modulation</b>	1 kHz tone	Weighted noise Recommendation ITU-R BS.559-2 [5], clause 1	1 kHz tone
	Band-limited to 4,5 kHz		
<b>Other modulation parameters</b>	40 %	50 % quasi-peak	80 % depth

### 4.2.3.2 FM testing

The generated FM signals (wanted and unwanted) and the blocking signal shall be in accordance with table 2. The configuration is based on Recommendation ITU-R BS.641 [i.6].

**Table 2: FM configuration**

Parameter	FM signals		AM signal
	<i>Wanted</i>	<i>Unwanted</i>	<i>Blocking</i>
<b>Audio modulation</b>	1 kHz tone	Weighted noise Recommendation ITU-R BS.559-2 [5], clause 1	1 kHz tone
	Band-limited to 15 kHz		
<b>Other modulation parameters</b>	±60,8 kHz peak deviation	32 kHz quasi-peak deviation (see note)	80 % depth
<b>Pilot tone</b>	None	None	
<b>NOTE:</b>	This is equivalent to $19 / \sqrt{2} = 13,4$ kHz RMS deviation in the absence of pre-emphasis.		

### 4.2.3.3 DAB testing

The generated DAB signals (wanted and unwanted) and the blocking signal shall be in accordance in table 3.

**Table 3: DAB configuration**

Parameter	DAB signal	AM signal
	<i>Wanted and Unwanted</i>	<i>Blocking</i>
Audio modulation	Service label: "Sine+" 1 kHz tone at a level of -3 dBFS Coding: mono, 128 kbit/s AAC	1 kHz tone
Other modulation parameters	DAB signal with EEP-3A to ETSI EN 300 401 [1], clause 15	80 % depth

### 4.2.3.4 DRM testing

The generated DRM signals (wanted and unwanted) and the blocking signal shall be in accordance in table 4.

**Table 4: DRM configuration**

Parameter	DRM signal				AM signal
	<i>Wanted and Unwanted</i>				<i>Blocking</i>
Audio coding	Service label: "Sine +" 1 kHz tone at a level of -3 dBFS Coding: mono AAC at maximum permitted rate				1 kHz tone
Frequency band		LF/MF	HF	VHF	
Channel coding parameters	RM flag	0	0	1	
	protection level	1	1	2	
	MSC mode	0	0	0	
	interleaver depth	1	1	0	
	robustness mode	B	B	E	
spectrum occupancy	2	3	0		
Other modulation Parameters	DRM signal to ETSI ES 201 980 [2], clause 8				80 % depth

## 4.2.4 Sensitivity

### 4.2.4.1 Definition

The receiver sensitivity is the minimum wanted signal level required to provide a given level of audio quality.

The appropriate measure of audio quality, known as the impairment criteria, are specified for each modulation type.

### 4.2.4.2 Limits

The limits for sensitivity specified in table 5 shall apply. Each figure quoted is the required level of wanted signal which provides a given level of audio quality. The audio impairment criteria relevant for these tests for the different demodulation types are given in table 6.