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

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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 to provide a means of conforming to the essential requirements of 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.1].

NOTE: The corresponding Commission's standardization request is expected shortly.

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
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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 the Radio Equipment Directive [i.1].

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# 1 Scope

The present document applies to devices that receive broadcast radio services, whether analogue or digital modulation is used. Multi-function devices may also fall under the requirements of other documents.

The present document contains requirements to demonstrate that radio equipment both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference.

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## 2 References

### 2.1 Normative 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.

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

- [1] ETSI EN 300 401 (V1.4.1) (06-2006): "Radio Broadcasting Systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers".
- [2] IEC 62104:2015: "Characteristics of DAB receivers".
- [3] ETSI ES 201 980 (V4.1.1) (01-2014): "Digital Radio Mondiale (DRM); System Specification".
- [4] CENELEC EN 55032:2015: "Electromagnetic compatibility of multimedia equipment - Emission Requirements".

### 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] Official Journal of the European Union L 153/62: "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] ECA table 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] IEC 60315-1:1988/ COR1:1997: "Methods of measurement on radio receivers for various classes of emission. Part 1: General considerations and methods of measurement, including audio-frequency measurements".

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## 3 Definitions and abbreviations

### 3.1 Definitions

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

**adjacent channel selectivity:** measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated interference signal in an adjacent channel separated from the wanted signal channel by a specified frequency offset

**broadcast receiver tuner port:** radio receiver tuner RF input connector

**radio equipment:** broadcast radio receiver comprising at least tuner and demodulator

### 3.2 Abbreviations

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

ACS	Adjacent Channel Selectivity
AM	Amplitude Modulation
AMSS	Amplitude Modulation Signalling System
BER	Bit Error Rate
BS	Broadcast Sound
DAB	Digital Audio Broadcasting
DC	Direct Current
DRM	Digital Radio Mondiale
ECA	European Common Allocation
EFTA	European Free Trade Area
EMF	ElectroMotive Force
FM	Frequency Modulation
HF	High Frequency
IEC	International Electrotechnical Commission
ITU-R	International Telecommunications Union - Radiocommunications
LF	Low Frequency
MF	Medium Frequency
PC	Personal Computer
RDS	Radio Data System
RF	Radio Frequency
TEM	Transverse Electro-Magnetic
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 supplier. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the 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.
- Frequency modulation, with or without RDS.
- Digital Audio Broadcasting.
- Digital Radio Mondiale.

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

NOTE: L-band (1 492 to 1 479,5 MHz) is listed in the current ECA for terrestrial DAB but is not in general use.

### 4.2.3 Configurations for testing

#### 4.2.3.1 AM

The generated AM signals 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>
Audio Modulation	1 kHz tone	Weighted noise
	Band-limited to 4,5 kHz	
	40 % peak	50 % quasi-peak



### 4.2.3.2 FM

The generated FM signals 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	
	<i>Wanted</i>	<i>Unwanted</i>
Audio Modulation	1 kHz tone, L = R	Weighted noise, L = R
	Band-limited to 15 kHz	
Pilot Tone	60,75 kHz peak deviation	32 kHz quasi-peak deviation
	19 kHz	None
	6,08 kHz peak deviation	-

### 4.2.3.3 DAB

The generated DAB signals (wanted and unwanted) shall be in accordance with ETSI EN 300 401 [1].

### 4.2.3.4 DRM

The generated DRM signals (wanted and unwanted) shall be in accordance with ETSI ES 201 980 [3].

## 4.2.4 Adjacent channel selectivity and blocking

### 4.2.4.0 Definition

The selectivity of a receiver is a measure of its ability to discriminate between a wanted signal to which the receiver is tuned and unwanted signals entering the broadcast receiver tuning port.

### 4.2.4.1 General requirements

In order to provide effective use of spectrum, devices shall be able to demodulate the tuned signal in the presence of similar signals in adjacent channels. The first, second and third adjacent channels both above and below the tuned signal shall be tested. In addition, testing shall also be performed to check the ability of the receiver to work effectively with signals at a greater separation from the wanted signal, known as blocking or far-off selectivity. The channel spacing specified in table 3 shall apply.

**Table 3: Channel spacing for adjacent channel selectivity and blocking**

Demodulation	Tuned frequency band	Wanted frequency	Unwanted frequency (N = 1,2 or 3)	Unwanted frequency (blocking)
AM	LF	216 kHz	$\pm N \times 9$ kHz	$\pm 90$ kHz
	MF	999 kHz	$\pm N \times 9$ kHz	$\pm 90$ kHz
	HF	see note	$\pm N \times 10$ kHz	$\pm 100$ kHz
FM	VHF band II	100 MHz	$\pm N \times 100$ kHz	$\pm 800$ kHz
DAB	VHF band III	202,160 MHz	$\pm N \times 1\,712$ kHz	$\pm 12$ MHz
DRM	LF	216 kHz	$\pm N \times 9$ kHz	$\pm 90$ kHz
	MF	999 kHz	$\pm N \times 9$ kHz	$\pm 90$ kHz
	HF	see note	$\pm N \times 10$ kHz	$\pm 100$ kHz
	VHF band I	65 MHz	$\pm N \times 100$ kHz	$\pm 800$ kHz
	VHF band II	100 MHz	$\pm N \times 100$ kHz	$\pm 800$ kHz
	VHF band III	200 MHz	$\pm N \times 100$ kHz	$\pm 800$ kHz

NOTE: For the HF bands, the wanted frequency should be chosen to be the closest 10 kHz to the centre of the tuned frequency band.

#### 4.2.4.2 Limits

The limits specified in table 4 shall apply.

**Table 4: Minimum adjacent channel selectivity and blocking requirements**

Demodulation	Tuned frequency band	1 <sup>st</sup> adjacent dB	2 <sup>nd</sup> adjacent dB	3 <sup>rd</sup> adjacent dB	Blocking dB
AM	LF	30	40	45	45
	MF	30	40	45	45
	HF	30	40	45	45
FM	VHF band II	-23	3	17	30
DAB	VHF band III	35	40	45	40
DRM	LF	25	35	45	50
	MF	25	35	45	50
	HF	25	35	45	50
	VHF band I	35	40	45	50
	VHF band II	35	40	45	50
	VHF band III	35	40	45	50

#### 4.2.4.3 Conformance

Conformance tests as defined in clause 5.3.1 shall be carried out. Only demodulation systems supported by the receiver shall be tested. Only bands supported by the receiver shall be tested.

#### 4.2.5 Unwanted emissions in the spurious domain

##### 4.2.5.1 Definition

Unwanted emissions in the spurious domain are emissions from the equipment in the frequency range defined by CEPT/ERC/Recommendation 74-01E [i.7].

##### 4.2.5.2 Limits

The limits in CENELEC EN 55032 [4], Class B shall not be exceeded.

##### 4.2.5.3 Conformance

Manufacturers shall provide a representative sample of the receiver system. The level of spurious emissions shall be measured by either:

- conducted (conducted differential voltage) emissions from an external RF port; and radiated emissions from the cabinet and structure of the equipment (cabinet radiation); or
- radiated emissions from the cabinet and the integral antenna.

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

#### 4.2.6 Sensitivity

##### 4.2.6.1 Definition

Receiver sensitivity is the ability to receive a wanted signal at low input signal levels while providing a pre-determined level of performance.

Receiver sensitivity is only specified for digital systems. The AM and FM bands are characterized by wide variations in the level of co-channel interference and therefore specifying a minimum requirement for sensitivity creates a limitation to the solutions provided by manufacturers. DAB and DRM have been designed to cope with variable levels of interference and system performance is determined by ensuring sufficient sensitivity.