



**Broadcast Sound Receivers;
Part 3: FM broadcast sound service;
Harmonised Standard for access to radio spectrum**

PREVIEW
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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.2] 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.

The present document is part 3 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

The present document has a number of test data files that are contained in archive en_30334501v010101p0.zip which accompanies ETSI EN 303 345-1 [1].

| 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 |
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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 provides the necessary limits and conformance requirements for radio receivers to meet the essential requirements of article 3.2 of Directive 2014/53/EU [i.1] for the FM sound broadcast service and is used with reference to ETSI EN 303 345-1 [1], which describes the generic requirements and test methods.

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1 Scope

The present document specifies the test signal configuration and the limits for sensitivity, selectivity and blocking for devices that receive FM broadcast sound services.

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/>.

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

- [1] ETSI EN 303 345-1 (V1.1.1) (06-2019): "Broadcast Sound Receivers; Part 1: Generic requirements and measuring methods".
- [2] Recommendation ITU-R BS.468-4 (07/1986): "Measurement of audio-frequency noise voltage level in sound broadcasting".
- [3] Recommendation ITU-R BS.559-2 (06/1990): "Objective measurement of radio-frequency protection ratios in LF, MF and HF 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] 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.
- [i.3] ETSI TR 100 028 (all parts) (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [i.4] ETSI TR 100 028-2 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".

- [i.5] Recommendation ITU-R BS.641 (07/1986): "Determination of radio-frequency protection ratios for frequency-modulated sound broadcasting".
- [i.6] AES17: "AES standard method for digital audio engineering - Measurement of digital audio equipment".
- [i.7] ETSI EG 203 336 (V1.1.1) (08-2015): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Guide for the selection of technical parameters for the production of Harmonised Standards covering article 3.1(b) and article 3.2 of Directive 2014/53/EU".
- [i.8] ITU GE84: "Final Acts of the Regional Administrative Radio Conference for the Planning of the VHF Sound Broadcasting (Region 1 and part of Region 3)".
- [i.9] Recommendation ITU-R BS.412-9 (12/1998): "Planning standards for terrestrial FM sound broadcasting at VHF".
- [i.10] Recommendation ITU-R SM.332-4 (07/1978): "Selectivity of Receivers".
- [i.11] CENELEC EN 55032:2015: "Electromagnetic compatibility of multimedia equipment - Emission Requirements".

3 Definition of terms, symbols and abbreviations

3.1 Terms

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

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

crest factor: peak to rms voltage ratio

external antenna: antenna designed to be connected to the equipment with the use of a 50 Ω or 75 Ω external connector

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

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

3.2 Symbols

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

dBFS: decibels relative to Full Scale in accordance with AES17 [i.6]

dBm: decibels relative to 1 mW of power

dBQ: audio decibels after Recommendation ITU-R BS.468-4 [2] noise weighting and a quasi-peak detector have been applied

dB μ V/m: decibels relative to 1 μ V/m

3.3 Abbreviations

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

| | |
|-------|---|
| ACS | Adjacent Channel Selectivity |
| ADC | Analogue to Digital Converter |
| ALC | Automatic Level Control |
| AM | Amplitude Modulation |
| BS | Broadcast Sound |
| BW | BandWidth |
| DDC | Direct Digital Conversion |
| EFTA | European Free Trade Association |
| EMCD | ElectroMagnetic Compatibility Directive |
| EU | European Union |
| FM | Frequency Modulation |
| IQ | In-phase and Quadrature |
| ITU-R | International Telecommunications Union - Radiocommunications sector |
| LO | Local Oscillator |
| NZIF | Near-Zero Intermediate Frequency |
| PC | Personal Computer |
| RED | Radio Equipment Directive |
| RF | Radio Frequency |
| RMS | Root Mean Square |
| SNR | Signal to Noise Ratio |
| VHF | Very High Frequency |

4 Technical requirements specifications

4.1 Test signal configurations

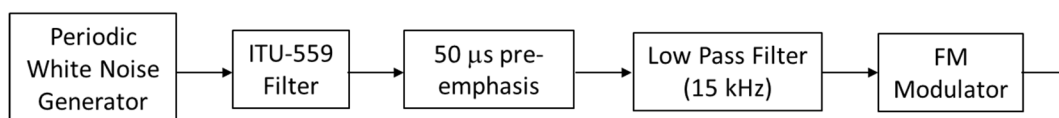
The generated FM signals (wanted and unwanted) and the blocking signal shall be in accordance with table 1. The configuration is based on Recommendation ITU-R BS.641 [i.5].

Table 1: FM configuration

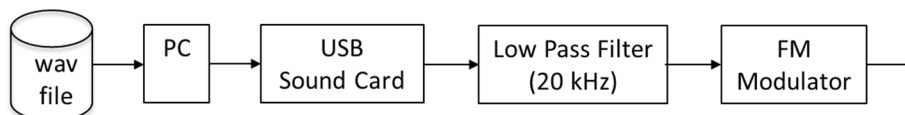
| Parameter | FM signals | | AM signal |
|------------------------------------|--------------------------|---|------------|
| | Wanted | Unwanted | Blocking |
| Audio modulation | 1 kHz tone | Weighted noise Recommendation ITU-R BS.559-2 [3], clause 1, band- limited to 15 kHz (see note 1) | 1 kHz tone |
| Other modulation parameters | ±60,8 kHz peak deviation | 15,9 kHz RMS deviation (see note 2) | 80 % depth |
| Pilot tone | None | None | |

NOTE 1: The filter shall have a cut-off frequency of 15 kHz and a minimum roll-off of 60 dB/octave.
NOTE 2: This is equivalent to a quasi-peak deviation of 34,8 kHz and has pre-emphasis enabled. The quasi-peak level measurement is defined by Recommendation ITU-R BS.641 [i.5], clause 5; with pre-emphasis disabled the quasi-peak deviation is 32 kHz (14,5 kHz RMS).

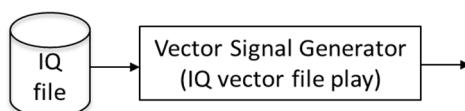
The means of generating the noise modulation for the "unwanted" signal is shown in figure 1.



a) Hardware method



b) PC sound card method



c) Vector signal generator method

NOTE: In a), the low pass filter has a cut-off frequency of 15 kHz and a minimum roll-off of 60 dB/octave; in b), the low pass filter has a cut-off frequency of 20 kHz and a minimum roll-off of 40 dB/octave.

Figure 1: Example arrangements for generating the unwanted signal

Waveform files to produce the signals using either the PC sound card method or the vector signal generator method are contained in archive en_30334501v010101p0.zip which accompanies ETSI EN 303 345-1 [1]. For further details see annex B.

4.2 Sensitivity

4.2.1 Definition

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

4.2.2 Limits

The limits for sensitivity specified in table 2 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 is that the audio SNR ≥ 40 dBQ ref $\pm 60,8$ kHz deviation, and that there shall be 10 seconds of audio with no subjective impairments (e.g. clicks resulting from FM threshold effects).

Table 2: FM sensitivity requirements

| De-modulation | Tuned frequency band | Wanted signal centre frequency (MHz) | Required sensitivity limit | |
|---------------|----------------------|--------------------------------------|----------------------------|-------------------------|
| | | | Conducted (dBm) | Radiated (dB μ V/m) |
| FM | VHF band II | 98 | -90 | 50 (see note) |

NOTE: For products with an integral antenna, the requirement is relaxed to 67 dB μ V/m.

4.2.3 Conformance

Conformance tests as defined in ETSI EN 303 345-1 [1], clause 5.3.4.1 shall be carried out. The wanted signal generator shall be set to produce a signal according to table 1 at the centre frequency according to table 2. The required sensitivity level shall be as indicated in table 2. If the impairment criteria given in clause 4.2.2 is met then the receiver has passed the sensitivity requirement.