

Draft **ETSI EN 302 077** V2.2.0 (2022-02)



**Transmitting equipment for the  
Digital Audio Broadcasting (DAB) service;  
Harmonised Standard for access to radio spectrum**  
(standards.iteh.ai)

[ETSI EN 302 077 V2.2.0 \(2022-02\)](https://standards.iteh.ai/catalog/standards/sist/137a31aa-1b6f-4dff-b0f3-b20fc675bf4f/etsi-en-302-077-v2-2-0-2022-02)  
<https://standards.iteh.ai/catalog/standards/sist/137a31aa-1b6f-4dff-b0f3-b20fc675bf4f/etsi-en-302-077-v2-2-0-2022-02>

## Reference

REN/ERM-TG17-201

## Keywords

audio, broadcasting, DAB, digital, harmonised  
standard, radio, regulation**ETSI**650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° w061004871**Important notice**

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at [www.etsi.org/deliver](http://www.etsi.org/deliver).

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommitteeSupportStaff.aspx><https://standards.iteh.ai/catalog/standards/sist/137a31aa-1b6f-4dfe-8222-02>**Notice of disclaimer & limitation of liability**

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

**Copyright Notification**

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2022.  
All rights reserved.

# Contents

Intellectual Property Rights .....	6
Foreword.....	6
Modal verbs terminology.....	7
1 Scope .....	8
2 References .....	8
2.1 Normative references .....	8
2.2 Informative references.....	9
3 Definition of terms, symbols and abbreviations.....	9
3.1 Terms.....	9
3.2 Symbols.....	10
3.3 Abbreviations .....	10
4 Technical requirements specifications .....	11
4.1 Environmental profile.....	11
4.2 Conformance requirements .....	11
4.2.1 Rated output power.....	11
4.2.1.1 Definition .....	11
4.2.1.2 Limit.....	11
4.2.1.3 Conformance.....	11
4.2.2 Frequency stability.....	11
4.2.2.1 Definition .....	11
4.2.2.2 Limit.....	12
4.2.2.3 Conformance.....	12
4.2.3 Crest factor.....	12
4.2.3.1 Definition .....	12
4.2.3.2 Limit.....	12
4.2.3.3 Conformance.....	12
4.2.4 Spurious emissions.....	12
4.2.4.1 Definition.....	12
4.2.4.2 Limits .....	12
4.2.4.3 Conformance.....	13
4.2.5 Out-of-band emissions.....	13
4.2.5.1 Definition .....	13
4.2.5.2 Limit.....	14
4.2.5.3 Conformance.....	17
4.2.6 MCOFDM systems: ACLR performance .....	18
4.2.6.1 Definition .....	18
4.2.6.2 Limit.....	18
4.2.6.3 Conformance.....	18
4.2.7 MCOFDM systems: MER performance .....	18
4.2.7.1 Definition .....	18
4.2.7.2 Limit.....	18
4.2.7.3 Conformance.....	18
4.2.8 Behaviour in case of erroneous ETI signal .....	18
4.2.8.1 Definition .....	18
4.2.8.2 Limit.....	18
4.2.8.3 Conformance.....	19
4.2.9 BER-Performance degradation .....	19
4.2.9.1 Definition .....	19
4.2.9.2 Limit.....	19
4.2.9.3 Conformance.....	19
5 Testing for compliance with technical requirements.....	19
5.1 Environmental conditions for testing .....	19
5.2 Test modulating signal .....	20
5.3 Methods of measurement .....	20

5.3.1	Rated output power .....	20
5.3.1.1	Initial conditions .....	20
5.3.1.2	Procedure .....	20
5.3.1.3	Test requirements .....	20
5.3.2	Frequency stability .....	20
5.3.2.1	Initial conditions .....	20
5.3.2.2	Procedure .....	21
5.3.2.3	Test requirements .....	21
5.3.3	Crest factor .....	21
5.3.3.1	Initial conditions .....	21
5.3.3.2	Procedure .....	21
5.3.3.3	Test requirements .....	21
5.3.4	Spurious emissions .....	21
5.3.4.1	Initial conditions .....	21
5.3.4.2	Procedure .....	22
5.3.4.3	Test requirements .....	22
5.3.5	Out-of-band emissions .....	22
5.3.5.1	Initial conditions .....	22
5.3.5.2	Procedure .....	22
5.3.5.3	Test requirements .....	22
5.3.6	MCOFDM systems: ACLR .....	22
5.3.6.1	Initial conditions .....	22
5.3.6.2	Procedure .....	22
5.3.6.3	Test requirements .....	23
5.3.7	MCOFDM systems: MER .....	23
5.3.7.1	Initial conditions .....	23
5.3.7.2	Procedure .....	23
5.3.7.3	Test requirements .....	23
5.3.8	Behaviour in case of erroneous ETI signal .....	23
5.3.8.1	Initial conditions .....	23
5.3.8.2	Procedure .....	23
5.3.8.3	Test requirements .....	23
5.3.9	BER-Performance degradation .....	24
5.3.9.1	Initial conditions .....	24
5.3.9.2	Procedure .....	24
5.3.9.3	Test requirements .....	24
<b>Annex A (informative):</b>	<b>Relationship between the present document and the essential requirements of Directive 2014/53/EU .....</b>	<b>25</b>
<b>Annex B (normative):</b>	<b>Measuring arrangements .....</b>	<b>27</b>
B.1	Testing arrangements for antenna port measurements .....	27
B.1.1	Antenna port measurements .....	27
B.1.2	Out-of-band emissions .....	28
B.1.3	MCOFDM: ACLR and MER performance .....	28
<b>Annex C (normative):</b>	<b>COFDM measuring arrangements .....</b>	<b>29</b>
C.1	ETI errors .....	29
C.2	Bit Error performance measurement .....	29
<b>Annex D (informative):</b>	<b>Practical measurement of spurious domain emissions .....</b>	<b>30</b>
D.1	Introduction .....	30
D.2	Directional coupler issues .....	30
<b>Annex E (informative):</b>	<b>Spectrum measurements .....</b>	<b>31</b>
<b>Annex F (informative):</b>	<b>MCOFDM systems .....</b>	<b>32</b>
F.1	Introduction .....	32

F.2 Architecture.....	33
<b>Annex G (informative): Maximum measurement uncertainty.....</b>	<b>35</b>
<b>Annex H (informative): Change history .....</b>	<b>36</b>
History .....	37

**iTeh STANDARD  
PREVIEW  
(standards.iteh.ai)**

[ETSI EN 302 077 V2.2.0 \(2022-02\)](https://standards.iteh.ai/catalog/standards/sist/137a31aa-1b6f-4dff-b0f3-b20fc675bf4f/etsi-en-302-077-v2-2-0-2022-02)  
<https://standards.iteh.ai/catalog/standards/sist/137a31aa-1b6f-4dff-b0f3-b20fc675bf4f/etsi-en-302-077-v2-2-0-2022-02>

# Intellectual Property Rights

## Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

## Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

## Foreword

(standards.iteh.ai)

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.

# iTeh STANDARD PREVIEW (standards.iteh.ai)

[ETSI EN 302 077 V2.2.0 \(2022-02\)](#)

<https://standards.iteh.ai/catalog/standards/sist/137a31aa-1b6f-4dff-b0f3-b20fc675bf4f/etsi-en-302-077-v2-2-0-2022-02>

# 1 Scope

The present document specifies technical characteristics and methods of measurements for transmitting equipment for broadcast sound services using the Digital Audio Broadcast (DAB) modulation system operating in VHF band III (174 MHz to 240 MHz).

DAB transmissions are licensed by national administrations. The Final Acts of the CEPT T-DAB Planning Meeting Constanța, 2007 (WI95revCO07) [i.2] and the Final Acts of the Regional Radiocommunication Conference for planning of the digital terrestrial broadcasting service in parts of Regions 1 and 3, in the frequency bands 174 MHz to 230 MHz and 470 MHz to 862 MHz (RRC-06) [i.3] provide spectrum masks for Out-of-Band emissions under different conditions. These requirements are represented by four transmission cases in the present document, see table 0. The license conditions set by the national administration stipulate which transmission case (Out-of-Band spectrum mask) applies.

**Table 0: Transmission cases**

Case	Description	Identification in WI95revCO07	Identification in RRC-06
1	Applicable to DAB transmissions operating in areas critical for adjacent channel DAB to DAB interference, and in any case when it is necessary to protect other services operating on adjacent frequencies on a primary basis	1: critical	2: sensitive
2	Applicable to DAB transmissions when no other case applies	2: non-critical	1: non-critical
3	Applicable to DAB transmitters in exceptional circumstances to protect safety services	Critical case considering protection of distress and safety frequencies	
4	Applicable to DAB transmissions operating on a case-by-case basis in certain areas		3: sensitive in certain areas where channel 12D is in use

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.

<https://standards.iteh.ai/catalog/standards/sist/137a31aa-1b6f-4dff-b0f3-b20fc675bf4f/etsi-en-302-077-v2-2-0-2022-02>

## 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.

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 ETS 300 799 (Edition 1) (09-1997): "Digital Audio Broadcasting (DAB); Distribution interfaces; Ensemble Transport Interface (ETI)".



## 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] Final Acts of the CEPT T-DAB Planning Meeting Constanța, 2007 (WI95revCO07).
- [i.3] Final Acts of the Regional Radiocommunication Conference for planning of the digital terrestrial broadcasting service in parts of Regions 1 and 3, in the frequency bands 174-230 MHz and 470-862 MHz (RRC-06).
- [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 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:

**Adjacent Channel Leakage Ratio (ACLR):** ratio of the mean power of the DAB signal in the OFDM block at  $f_L$  to the mean power of the unoccupied OFDM block within the MCOFDM group

**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.

**DAB transmitter:** device comprising a DAB exciter and RF amplifier

**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.

**harmonic:** component of order greater than 1 of the Fourier series of a periodic quantity

**high power transmitter:** transmitter whose rated output power is greater than 1 000 W per OFDM block

**intermodulation products:** unwanted frequencies resulting from intermodulation between carriers or harmonics of emission, or between any oscillations generated to produce the carrier

**low power transmitter:** transmitter whose rated output power is less than or equal to 25 W per OFDM block

**MCOFDM group:** group of OFDM blocks generated by a MCOFDM system

**MCOFDM system:** low power transmitter system that generates more than one OFDM block with an overall RF system filter spanning all blocks

**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

**medium power transmitter:** transmitter whose rated output power is greater than 25 W and less than or equal to 1 000 W per OFDM block

**necessary bandwidth:** 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

**OFDM block:** group of digitally modulated carriers comprising a complete DAB ensemble

**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

**rated output power:** mean power that the transmitter delivers at its antenna port under specified conditions of operation

**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.

**spurious emissions:** emissions 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:

"	inch
C/N	Carrier power to Noise power density
Hz	Hertz (cycles per second)
m	metre
μ	micro, 10 <sup>-6</sup>
V	Volt
W	Watt

## 3.3 Abbreviations

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

ACLR	Adjacent Channel Leakage Ratio
BER	Bit Error Ratio
COFDM	Coded Orthogonal Frequency Division Multiplex
CRC	Cyclic Redundancy Check
CW	Continuous Wave
DAB	Digital Audio Broadcasting
EDI	Encapsulation of DAB Interfaces
EFTA	European Free Trade Association
EMC	ElectroMagnetic Compatibility
ETI	Ensemble Transport Interface
EUT	Equipment Under Test
MCOFDM	Multiple Coded Orthogonal Frequency Division Multiplex
MER	Modulation Error Ratio

N	Noise power
OFDM	Orthogonal Frequency Division Multiplex
OOB	Out-Of-Band
PRBS	Pseudo Random Binary Sequence
RF	Radio Frequency
RMS	Root Mean Square
SFN	Single Frequency Network
TII	Transmitter Identification Information
Tx	Transmitter
VHF	Very High Frequency

---

## 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 in accordance with its intended use. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the operational environmental profile defined by its intended use.

### 4.2 Conformance requirements

#### 4.2.1 Rated output power

##### 4.2.1.1 Definition (standards.iteh.ai)

The rated output power is the mean power that the transmitter shall deliver at its antenna port.

For MCOFDM systems, the rated output power is the mean power of the highest powered OFDM block within the MCOFDM group.

Transmitters shall be categorized into one of three power classes, as follows:

- low power;
- medium power;
- high power.

##### 4.2.1.2 Limit

The output power shall be within -0,5 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 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

The stability of the centre frequency shall not deviate more than 10 Hz from its nominal value.

#### 4.2.2.3 Conformance

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

### 4.2.3 Crest factor

#### 4.2.3.1 Definition

Maximum ratio of peak power to mean power levels.

#### 4.2.3.2 Limit

The peak level of the output RF power signal shall not exceed the mean power level by more than 13 dB.

#### 4.2.3.3 Conformance

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

### 4.2.4 Spurious emissions

#### 4.2.4.1 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.

ETSI EN 302 077 V2.2.0 (2022-02)

For the purposes of the present document spurious emissions are emissions at frequencies below  $f_L - 3$  MHz, where  $f_L$  is the centre frequency of the lowest frequency OFDM block, and above  $f_H + 3$  MHz, where  $f_H$  is the centre frequency of the highest frequency OFDM block of the transmission, irrespective of the number of blocks employed. In the case of a single block transmitter,  $f_L = f_H$ .

The reference bandwidth used for spurious emissions measurements shall be as follows:

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

#### 4.2.4.2 Limits

Spurious emissions shall not exceed the values set out in table 1, shown additionally in figure 1, for the frequency range 9 kHz to 3 GHz at the output of the RF system filter.