

**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
Transmitting equipment for the digital television
broadcast service, Terrestrial (DVB-T);
Part 2: Harmonized EN covering the essential requirements
of article 3.2 of the R&TTE Directive**



Reference

REN/ERM-TG17WG1-002-2

Keywords

broadcasting, digital, radio, regulation, terrestrial,
transmitter, TV, video

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 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

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

<http://portal.etsi.org/tb/status/status.asp>

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

http://portal.etsi.org/chaicor/ETSI_support.asp

Copyright Notification

No part may be reproduced except as authorized by written permission.
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2011.
All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™**, **TIPHON™**, the TIPHON logo and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.

3GPP™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

LTE™ is a Trade Mark of ETSI currently being registered for the benefit of its Members and of the 3GPP Organizational Partners.

GSM® and the GSM logo are Trade Marks registered and owned by the GSM Association.

Contents

Intellectual Property Rights	5
Foreword.....	5
Introduction	5
1 Scope	6
2 References	6
2.1 Normative references	6
2.2 Informative references.....	7
3 Definitions, symbols and abbreviations	7
3.1 Definitions	7
3.2 Symbols.....	8
3.3 Abbreviations	8
4 Technical requirements specifications	8
4.1 Environmental profile.....	8
4.2 Conformance requirements	9
4.2.1 Introduction.....	9
4.2.2 Spurious emissions	9
4.2.2.1 Definition	9
4.2.2.2 Limits	9
4.2.2.3 Conformance test	9
4.2.3 Out-of-band emissions.....	11
4.2.3.1 Definition	11
4.2.3.2 Limits	11
4.2.3.3 Conformance test	13
4.2.4 Cabinet radiation.....	14
4.2.4.1 Definition	14
4.2.4.2 Limits	14
4.2.4.2.1 Limits for radiated emissions below 1 GHz	14
4.2.4.2.2 Limits for radiated emissions above 1 GHz.....	14
4.2.4.3 Conformance test	15
5 Testing for compliance with technical requirements.....	16
5.1 Environmental conditions for testing	16
5.2 Interpretation of the measurement results	16
5.3 Test conditions	16
5.3.1 Test frequency range.....	16
5.3.2 Test modulation signal.....	17
5.4 Essential radio test suites.....	17
5.4.1 Spurious emissions	17
5.4.1.1 Initial conditions	17
5.4.1.2 Test procedure.....	18
5.4.1.3 Test requirements.....	18
5.4.1.4 Test arrangement.....	18
5.4.2 Out-of-band emissions.....	18
5.4.2.1 Initial conditions	18
5.4.2.2 Test procedure.....	19
5.4.2.3 Test requirements.....	19
5.4.2.4 Test arrangement.....	19
5.4.3 Cabinet radiation.....	20
5.4.3.1 Initial conditions	20
5.4.3.2 Test procedure.....	20
5.4.3.3 Test requirements.....	20
5.4.3.4 Test arrangement.....	21

Annex A (normative):	HS Requirements and conformance Test specifications Table (HS-RTT).....	22
Annex B (informative):	The EN title in the official languages	24
Annex C (informative):	Bibliography.....	25
History		26

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is 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 (<http://webapp.etsi.org/IPR/home.asp>).

Pursuant to the ETSI IPR Policy, no investigation, 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.

Foreword

This final draft Harmonized 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 Two-step Approval Procedure.

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC [i.1] (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Directive 1999/5/EC [2] of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity ("the R&TTE Directive").

The requirements relevant to Directive 1999/5/EC [2] are summarised in annex A.

The present document is part 2 of a multi-part deliverable covering Transmitting equipment for the digital television broadcast service, Terrestrial (DVB-T), as identified below:

Part 1: "Technical characteristics and test methods";

Part 2: "Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".

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

Introduction

The present document is part of a set of standards developed by ETSI and is designed to fit in a modular structure to cover all radio and telecommunications terminal equipment within the scope of the R&TTE Directive [2]. The modular structure is shown in EG 201 399 [i.2].

Other document directly associated with the present document:

- EN 301 489-14 [4].

1 Scope

The present document applies to transmitting equipment for the terrestrial digital television broadcasting service.

The types of equipment covered by the present document are as follows:

Transmitting equipment for digital television broadcasting service, with 7 MHz and 8 MHz RF channel bandwidths, operating in the CEPT frequency bands. These frequencies are currently within the television Bands III, IV and V.

The present document is intended to cover the provisions of Directive 1999/5/EC [2] (R&TTE Directive), Article 3.2, which states that "..... radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communications and orbital resources so as to avoid harmful interference".

In addition to the present document, other ENs that specify technical requirements in respect of essential requirements under other parts of article 3 of the R&TTE Directive [2] may apply to equipment within the scope of the present document.

NOTE: A list of such ENs is included on the web site <http://www.newapproach.org>.

2 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 reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://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.

2.1 Normative references

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

- | | |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [1] | Void. |
| [2] | Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive). |
| [3] | Void. |
| [4] | ETSI EN 301 489-14 (V1.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 14: Specific conditions for analogue and digital terrestrial TV broadcasting service transmitters". |
| [5] | CENELEC EN 55022:2006 + A1:2007: "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement". |
| [6] | CENELEC EN 55011:2007 + A2:2007: "Industrial, scientific and medical (ISM) radio-frequency equipment - Radio disturbance characteristics - Limits and methods of measurement". |
| [7] | ETSI TR 100 028-1 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1". |
| [8] | 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". |

- [9] CENELEC EN 55016-1-1:2007 + A1:2007 + A2:2008: "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus".
- [10] CISPR 16-2-3: "Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-3: Methods of measurement of disturbances and immunity - Radiated disturbance measurements" (Ed. 2.0 b:2006).
- [11] CENELEC EN 55016-4-2:2004: "Specification for radio disturbance and immunity measuring apparatus and methods - Part 4-2: Uncertainties, statistics and limit modelling - Uncertainty in EMC measurements".
- [12] ETSI EN 300 744 (V1.6.1): "Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for digital terrestrial television".

2.2 Informative references

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 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.
- [i.2] ETSI EG 201 399 (V2.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of candidate Harmonized Standards for application under the R&TTE Directive".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

antenna port: port of an apparatus which is designed, in normal operation, to be connected to an antenna using coaxial cable

carrier power: average power supplied to the antenna port by a transmitter during one radio frequency cycle taken under the condition of no modulation

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*.

digital signal: discretely timed signal in which information is represented by a finite number of well defined discrete values that its characteristic quantities may take in time

digital television: television in which all information is represented by a digital signal

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.

environmental profile: range of environmental conditions under which equipment within the scope of the present document is required to comply with the provisions of the present document

exclusion band: band of radio frequencies where no measurements are made

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

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 port by a transmitter during an interval of time sufficiently long compared with the lowest frequency encountered in the modulation taken under normal operating conditions

necessary bandwidth: for a given class of emission, the 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

rated output power: power that the transmitter or transposer delivers at its output under specified conditions of operation

reference bandwidth: bandwidth in which the emission level is specified

3.2 Symbols

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

μ	Micro
---	-------

3.3 Abbreviations

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

dB	logarithmic ratio (tenths of a "Bel")
dBm	dB relative to one milliwatt
EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
FAR	Fully Anechoic Room
GHz	GigaHertz
kHz	kiloHertz
LV	Low Voltage
m	metres
MHz	MegaHertz
OATS	Open Area Test Site
R&TTE	Radio and Telecommunications Terminal Equipment
W	Watt

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 Introduction

To meet the requirement under article 3.2 of the R&TTE Directive [2] two essential parameters have been identified. Table 1 provides a cross reference between these two essential parameters and the corresponding three technical requirements for equipment within the scope of the present document. To fulfil an essential parameter the compliance with all the corresponding technical requirements in Table 4.1 must be verified.

Table 4.1: Cross references

Essential parameter	Corresponding technical requirements
Conducted emissions from antenna port	4.2.2 Spurious emissions
	4.2.3 Out-of-band emissions
Radiated emissions from enclosure port	4.2.4 Cabinet radiation

4.2.2 Spurious emissions

4.2.2.1 Definition

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. These include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out of band emissions.

For the purposes of the present document spurious emissions are emissions at frequencies outside the frequency range $f_0 \pm 14$ MHz for 7 MHz channels, $f_0 \pm 12$ MHz for 8 MHz channels, where f_0 is the centre frequency of the channel, irrespective of the number of carriers employed.

4.2.2.2 Limits

Spurious emissions shall not exceed the values set out in Table 4.2 additionally shown in Figures 4.1 and 4.2, for the frequency range 9 kHz to 4,5 GHz.

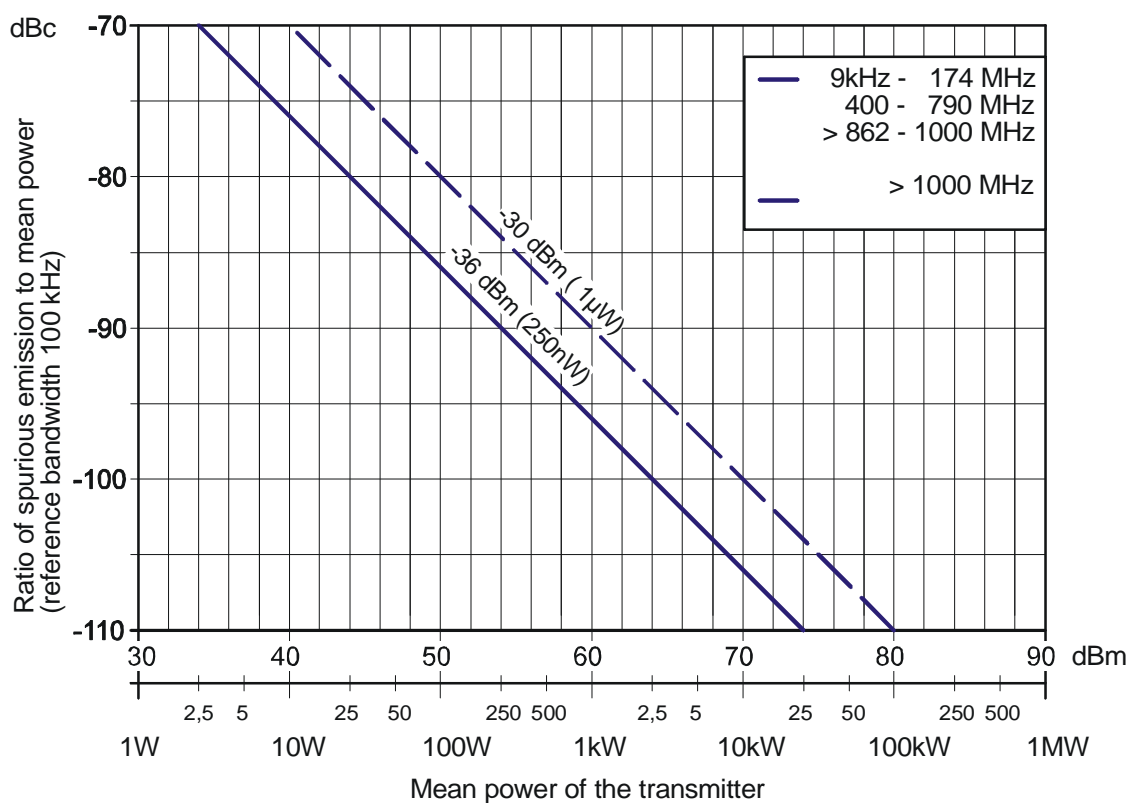
In the case of a DVB-T transmitter supplied without an internal bandpass output filter, the manufacturer shall specify the characteristics of the filter necessary to fulfil the spurious emission limits defined in Table 4.2. The manufacturer shall include this information in their test report.

Table 4.2: Spurious emission limits for DVB-T transmitters

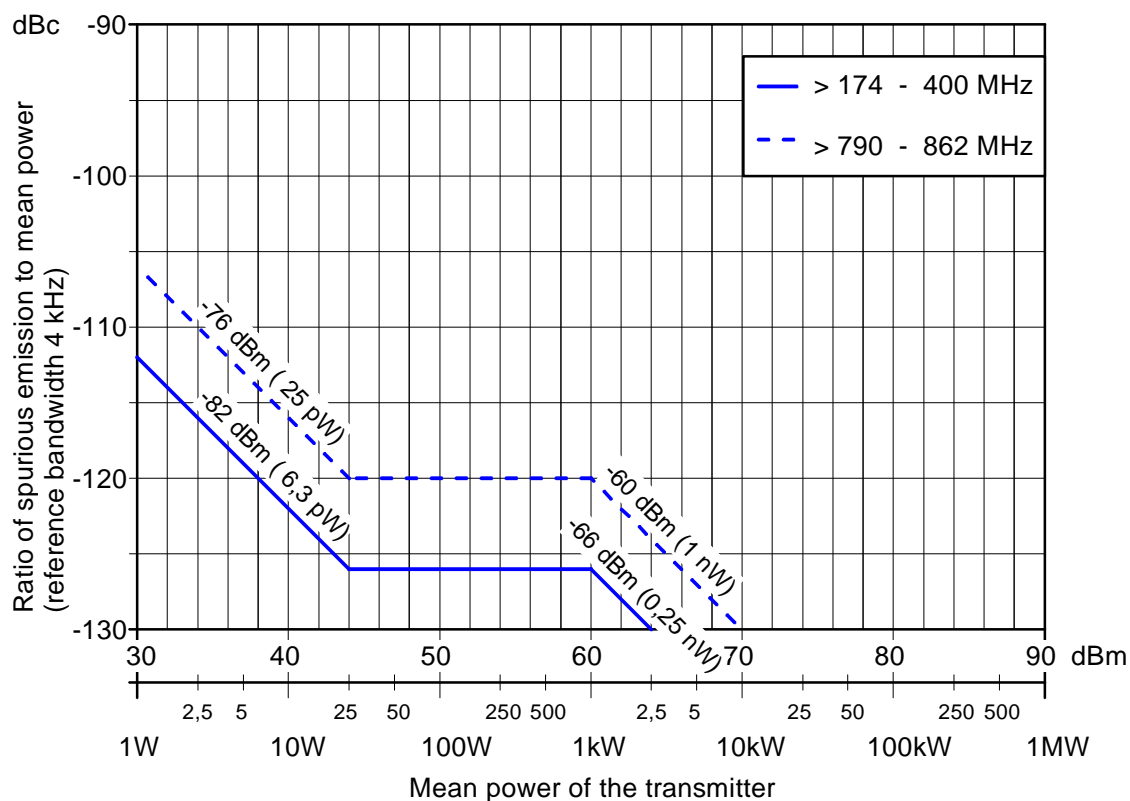
Frequency range of the spurious emission	Limits of the spurious emission	Reference bandwidth	Figure
9 kHz to 174 MHz	-36 dBm (250 nW)	100 kHz	4.1
> 174 MHz to 400 MHz	-82 dBm, for $P \leq 25$ W -126 dBc, for 25 W < $P \leq 1\,000$ W -66 dBm, for $1\,000$ W < P	4 kHz	4.2
> 400 MHz to 790 MHz	-36 dBm (250 nW)	100 kHz	4.1
> 790 MHz to 862 MHz	-76 dBm, for $P \leq 25$ W -120 dBc, for 25 W < $P \leq 1\,000$ W -60 dBm, for $1\,000$ W < P	4 kHz	4.2
> 862 MHz to 1 000 MHz	-36 dBm (250 nW)	100 kHz	4.1
> 1 000 MHz	-30 dBm (1 µW)	100 kHz	4.1
NOTE: P = mean power of the transmitter.			

4.2.2.3 Conformance test

Conformance tests described in clause 5.3.1 shall be carried out.



**Figure 4.1: Spurious emission limits for DVB-T transmitters
(100 kHz reference bandwidth)**



**Figure 4.2: Spurious emission limits for DVB-T transmitters
(4 kHz reference bandwidth)**

4.2.3 Out-of-band emissions

4.2.3.1 Definition

Emissions on a frequency or frequencies immediately outside the necessary bandwidth but exclude spurious emissions.

For the purposes of the present document out-of-band emissions are emissions at frequencies outside the necessary bandwidth and within the frequency ranges $f_0 \pm 14$ MHz for 7 MHz channels, $f_0 \pm 12$ MHz for 8 MHz channels, where f_0 is the centre frequency of the channel, irrespective of the number of carriers employed.

4.2.3.2 Limits

Out-of-band emissions shall not exceed the limits specified in Tables 4.3 and 4.4, additionally shown in Figures 4.3 and 4.4.

Out-of-band emissions limits are given as mean power level measured in a 4 kHz bandwidth, where 0 dB corresponds to the mean output power.

Unless otherwise declared by the manufacturer it shall be assumed that the EUT conforms to the non-critical case.

For critical cases such as television channels adjacent to other services (low power or receive only) a spectrum mask with higher of out-of-channel attenuation may be needed.

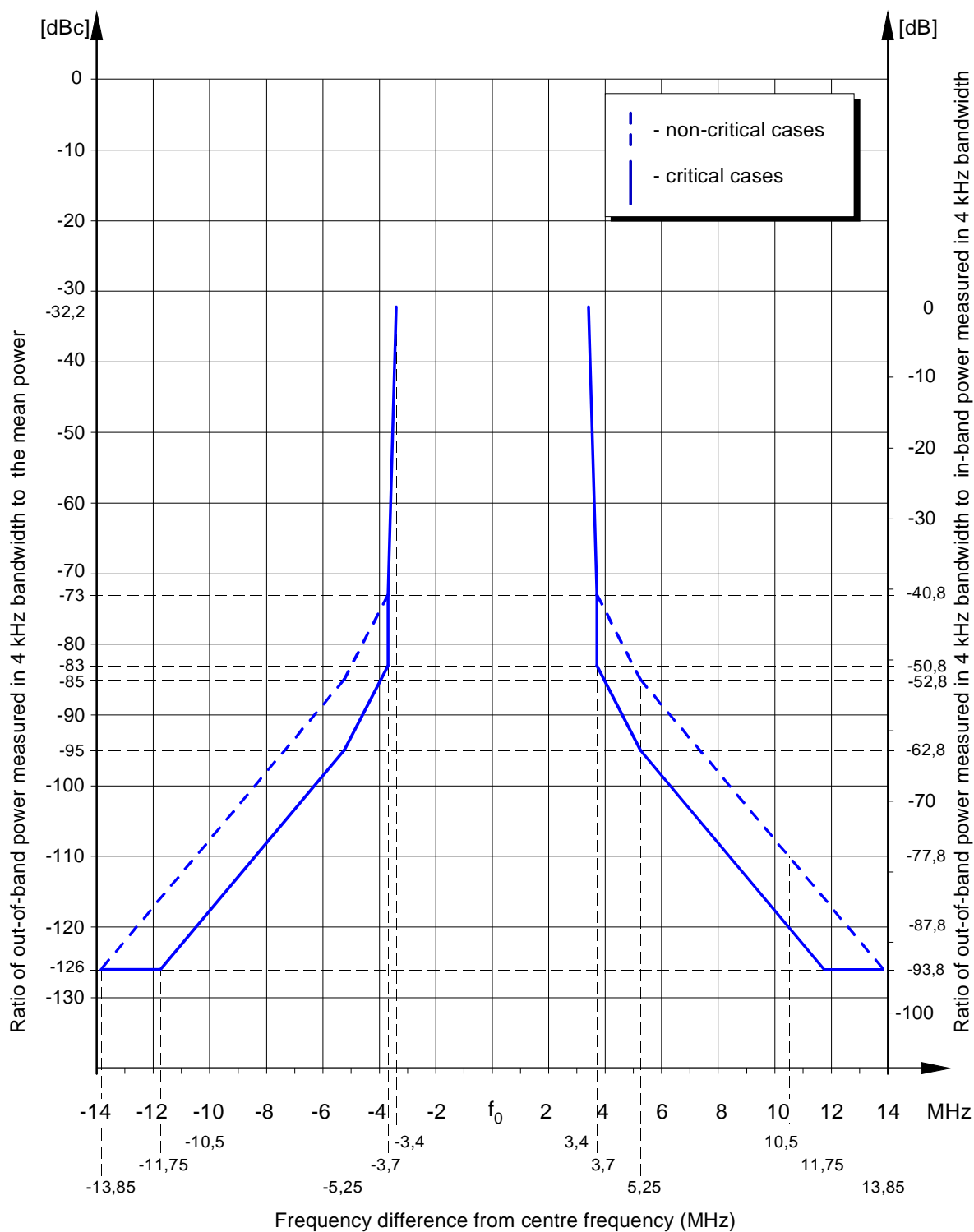
In the case of a DVB-T transmitter supplied without an internal bandpass output filter, the manufacturer shall specify the characteristics of the filter necessary to fulfil the out-of-band emission masks defined in Tables 4.3 and 4.4. The manufacturer shall include this information in their test report.

Table 4.3: Out-of-band emission limits for DVB-T transmitter with output power ≥ 25 W

Classification accordingly the frequency assignment	7 MHz Channel, frequency difference from the centre frequency (MHz)	8 MHz Channel, frequency difference from the centre frequency (MHz)	Relative level (dBc)
Non-critical cases	$\pm 3,4$	$\pm 3,81$	-32,2/-32,8
	$\pm 3,7$	$\pm 4,2$	-73
	$\pm 5,25$	± 6	-85
	$\pm 10,5$	± 12	-110
	$\pm 13,85$	-	-126
Critical cases	$\pm 3,4$	$\pm 3,81$	-32,2/-32,8
	$\pm 3,7$	$\pm 4,2$	-83
	$\pm 5,25$	± 6	-95
	$\pm 10,5$	± 12	-120
	$\pm 11,75$	-	-126

Table 4.4: Out-of-band emission limits for DVB-T transmitter with output power < 25 W

Classification accordingly the frequency assignment	7 MHz Channel, frequency difference from the centre frequency (MHz)	8 MHz Channel, frequency difference from the centre frequency (MHz)	Absolute level (dBm)
Non-critical cases	$\pm 3,4$	$\pm 3,81$	11,8/11,2
	$\pm 3,7$	$\pm 4,2$	-29
	$\pm 5,25$	± 6	-41
	$\pm 10,5$	± 12	-66
	$\pm 13,85$	-	-82
Critical cases	$\pm 3,4$	$\pm 3,9$	11,8/11,2
	$\pm 3,7$	$\pm 4,2$	-39
	$\pm 5,25$	± 6	-51
	$\pm 10,5$	± 12	-76
	$\pm 11,75$	-	-82



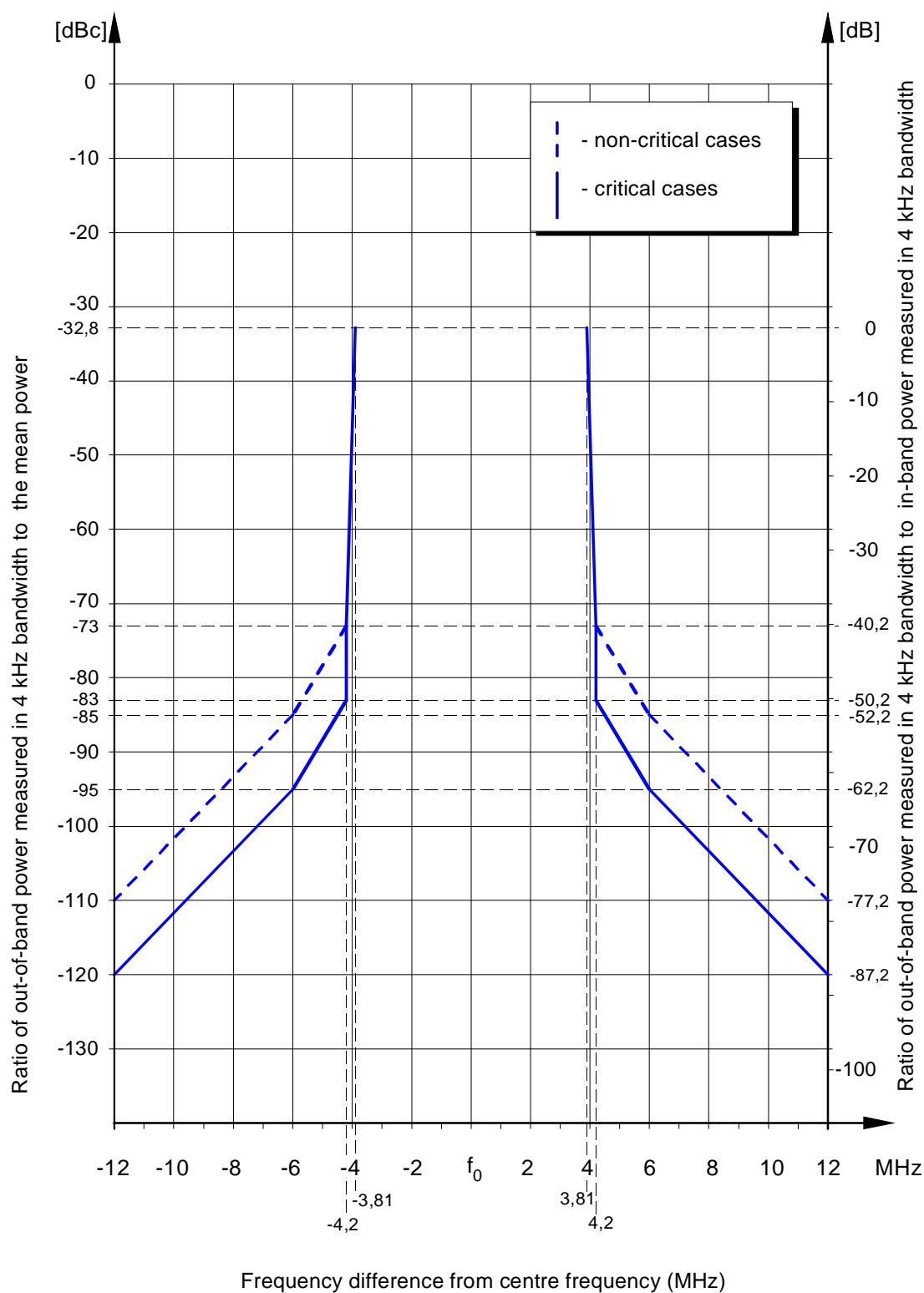


Figure 4.4: Out-of-band limits for DVB-T transmitters ≥ 25 W in 8 MHz channels

4.2.3.3 Conformance test

Conformance tests described in clause 5.3.2 shall be carried out.

4.2.4 Cabinet radiation

4.2.4.1 Definition

Emissions from the equipment, radiated from the enclosure port, other than those present at the antenna port.

4.2.4.2 Limits

4.2.4.2.1 Limits for radiated emissions below 1 GHz

Radiated emissions below 1 GHz shall not exceed the values set out in Table 4.5, shown additionally in Figure 4.5, for the frequency range 30 MHz to 1 GHz.

This test shall be performed at a distance of 10 m, where feasible. When size and/or power requirements necessitate testing in a manufacturing facility, other distances may be used (see notes 1, 2 and 3).

NOTE 1: The measurements can be carried out at other distances. In that case limits are modified according to the relation:

$$L(x) = L(10\text{m}) + 20 \log (10/x) \quad \text{where } x = \text{distance in metre (m)}.$$

NOTE 2: Care should be taken if measuring at test distances below 10 m as this may be in the near field.

NOTE 3: In cases of dispute the measurement distance of 10 m shall take precedence.

Table 4.5: Cabinet radiation limits below 1 GHz

Frequency range	Quasi-peak limits (dB μ V/m) at 10 m
30 MHz to 230 MHz	$40 \text{ dB}\mu\text{V/m} \leq 60 + 10 \log_{10} (P/2\,000) \leq 70 \text{ dB}\mu\text{V/m}$
> 230 MHz to 1 GHz	$47 \text{ dB}\mu\text{V/m} \leq 67 + 10 \log_{10} (P/2\,000) \leq 77 \text{ dB}\mu\text{V/m}$
NOTE: P = Rated output power in W.	

4.2.4.2.2 Limits for radiated emissions above 1 GHz

Radiated emissions above 1 GHz shall not exceed the values set out in Table 4.6, shown additionally in Figure 4.5, for the frequency range 1 GHz to 4,5 GHz.

Alternatively the limits in Table 4.7 can be used.

NOTE: The measurements can be carried out at other distances. In that case limits are modified according to the relation:

$$L(x) = L(3\text{m}) + 20 \log (3/x) \quad \text{where } x = \text{distance in metre (m)}.$$

In cases of dispute the measurement distance of 3 m shall take precedence.

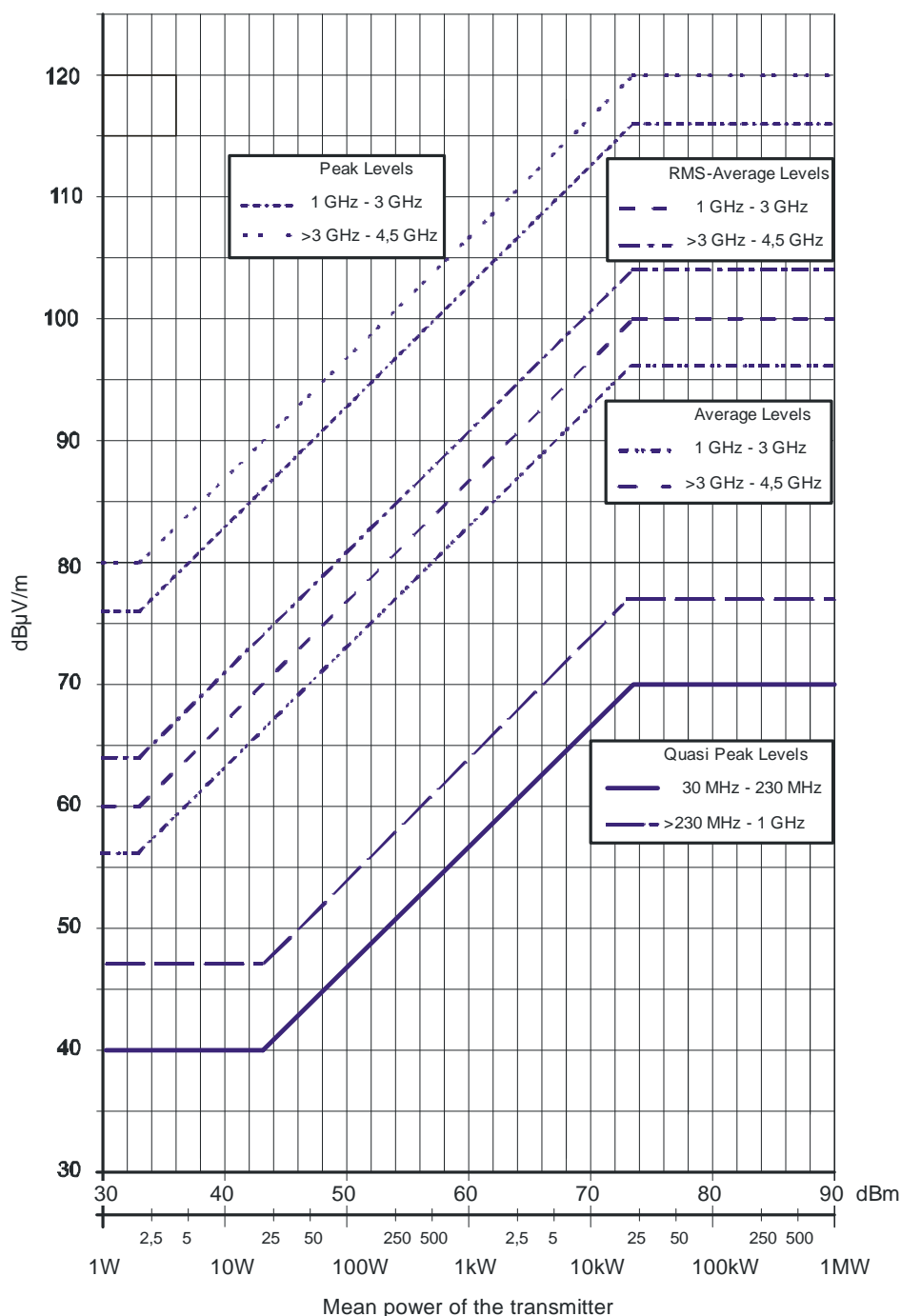
Table 4.6: Cabinet radiation limits above 1 GHz

Frequency range	Average limits (dB μ V/m) at 3 m	Peak limits (dB μ V/m) at 3 m
1 GHz to 3 GHz	$56 \text{ dB}\mu\text{V/m} \leq 86 + 10 \log_{10} (P/2\,000) \leq 96 \text{ dB}\mu\text{V/m}$	$76 \text{ dB}\mu\text{V/m} \leq 106 + 10 \log_{10} (P/2\,000) \leq 116 \text{ dB}\mu\text{V/m}$
> 3 GHz to 4,5 GHz	$60 \text{ dB}\mu\text{V/m} \leq 90 + 10 \log_{10} (P/2\,000) \leq 100 \text{ dB}\mu\text{V/m}$	$80 \text{ dB}\mu\text{V/m} \leq 110 + 10 \log_{10} (P/2\,000) \leq 120 \text{ dB}\mu\text{V/m}$
NOTE: P = Rated output power in W.		

Table 4.7: Cabinet radiation limits above 1 GHz

Frequency range	RMS-Average limits (dB μ V/m) at 3 m (see notes 1 and 2)
1 GHz to 3 GHz	$60 \text{ dB}\mu\text{V/m} \leq 90 + 10 \log_{10} (P/2\,000) \leq 100 \text{ dB}\mu\text{V/m}$
> 3 GHz to 4,5 GHz	$64 \text{ dB}\mu\text{V/m} \leq 94 + 10 \log_{10} (P/2\,000) \leq 104 \text{ dB}\mu\text{V/m}$

NOTE 1: P = Rated output power in W.
NOTE 2: For RMS-Average detector, please refer to EN 55016-1-1 [9].

**Figure 4.5: Cabinet radiation limits for DVB-T transmitters 30 MHz to 4,5 GHz**

4.2.4.3 Conformance test

Conformance tests described in clause 5.3.3 shall be carried out.

5 Testing for compliance with technical requirements

5.1 Environmental conditions for testing

Tests defined in the present document shall be carried out at representative points within the boundary limits of the declared operational environmental profile.

Where technical performance varies subject to environmental conditions, tests shall be carried out under a sufficient variety of environmental conditions (within the boundary limits of the declared operational environmental profile) to give confidence of compliance for the affected technical requirements.

5.2 Interpretation of the measurement results

The interpretation of the results recorded in a test report for the measurements described in the present document shall be as follows:

- the measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements of the present document;
- the value of the measurement uncertainty for the measurement of each parameter shall be included in the test report;
- the recorded value of the measurement uncertainty shall be, for each measurement, equal to or lower than the figures in Table 5.1.

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated and shall correspond to an expansion factor (coverage factor) $k = 1,96$ or $k = 2$ (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterising the actual measurement uncertainties are normal (Gaussian)). Principles for the calculation of measurement uncertainty are contained in TR 100 028-1 [7] and TR 100 028-2 [8].

Table 5.1 is based on such expansion factors.

Table 5.1: Maximum measurement uncertainty

Parameter	Condition	Uncertainty
Spurious emissions (Conducted emissions)	$f \leq 2,2$ GHz	2,5 dB
	$2,2$ GHz $< f \leq 4$ GHz	3,0 dB
	$f > 4$ GHz	5,0 dB
Out-of-band emissions (Conducted emissions)		2,5 dB
Cabinet radiation (radiated emissions) see note	30 MHz $< f \leq 1$ GHz (OATS)	6,3 dB
	30 MHz $< f \leq 1$ GHz (FAR)	5,3 dB
	1 GHz $< f \leq 4,5$ GHz (FAR)	5,2 dB
NOTE: Please refer to EN 55016-4-2 [11], clause 4.1, Table 1.		

5.3 Test conditions

5.3.1 Test frequency range

Limits on unwanted emissions for radio equipments are considered to be applicable to the range 9 kHz to 300 GHz. However, for practical measurement purposes, the frequency range of spurious emissions may be restricted. As guidance for practical purposes, the following measurement parameters in Table 5.2 are recommended.

Table 5.2: Test frequency range

Transmitter fundamental frequency range	Unwanted emission frequency measurement range	
	lower frequency	upper frequency
47 MHz to 862 MHz	9 kHz	4,5 GHz

The following reference bandwidths are to be used:

For spurious emissions:

- 100 kHz between 9 kHz and 174 MHz;
- 4 kHz between 174 MHz and 400 MHz;
- 100 kHz between 400 MHz and 790 MHz;
- 4 kHz between 790 MHz and 862 MHz;
- 100 kHz between 862 MHz and 1 000 MHz;
- 100 kHz above 1 000 MHz.

For out-of-band emissions:

- 4 kHz

NOTE: For Cabinet Radiation measurements please refer to EN 55016-1-1 [9] or CISPR 16-2-3 [10].

5.3.2 Test modulation signal

The modulation signal at the input of the transmitter shall be as stated in EN 300 744 [12], clause 4.3, but with the following specific settings:

- Mode 8 K.
- Guard interval duration 1/32.
- TS modulation 64 QAM.
- Code Ratio 2/3.

5.4 Essential radio test suites

5.4.1 Spurious emissions

5.4.1.1 Initial conditions

Test environment:

- the normal operating environment, as declared by the equipment manufacturer.

Test frequencies:

- 1) the lowest operating frequency of the EUT;
- 2) the highest operating frequency of the EUT;
- 3) a frequency mid-way between 1) and 2) above.

Test arrangement (see Figure 5.1):

- 1) connect the EUT to the test load, via the coupling device;

- 2) connect the spectrum analyser to the coupling device.

For the purposes of this test no test signal is required, the manufacturer shall ensure that the full rated output power of the transmitter will be maintained during this test.

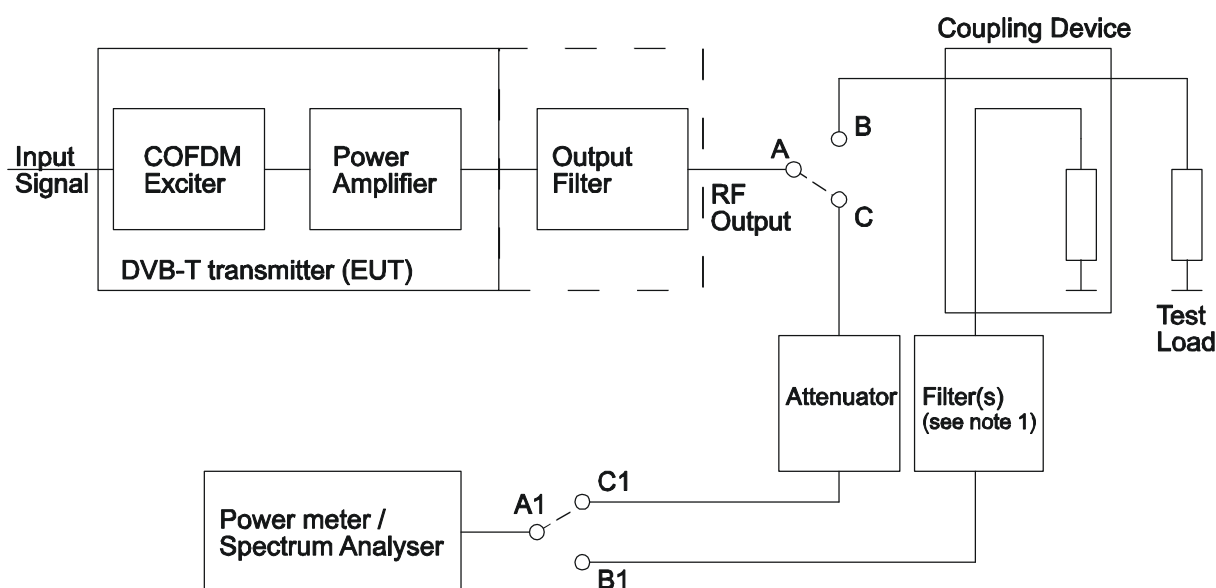
5.4.1.2 Test procedure

- 1) operate the EUT at each of the test frequencies as defined in clause 5.3.1.2;
- 2) measure the results on the spectrum analyser.

5.4.1.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.2.2 in order to demonstrate compliance.

5.4.1.4 Test arrangement



NOTE 1: The optional filter should suppress the output signal so that no intermodulation products are generated by the spectrum analyser. The insertion loss throughout the measuring range should be known.

NOTE 2: For high power transmitters the preferred set up would require A to be connected to B and A1 to be connected to B1.

NOTE 3: For low power transmitters the preferred set up would require A to be connected to C and A1 to be connected to C1.

NOTE 4: If the transmitter does not include any output filter, an external filter shall be added after the transmitter for the testing arrangement. This filter shall be representative of the multiplexer or filter existing in operational conditions and viewed by the transmitted output when installed. In this case, the antenna port measurements shall be performed at the output of this extra filter.

Figure 5.1: Testing arrangement for spurious emissions

5.4.2 Out-of-band emissions

5.4.2.1 Initial conditions

Test environment:

- the normal operating environment, as declared by the equipment manufacturer.

Test frequencies:

- 1) the lowest operating frequency of the EUT;
- 2) the highest operating frequency of the EUT;
- 3) a frequency mid-way between 1) and 2) above.

Test arrangement (see Figure 5.2):

- 1) connect the EUT to the test load, via the coupling device;
- 2) connect the spectrum analyser to the coupling device.

For the purposes of this test no test signal is required, the manufacturer shall ensure that the full rated output power of the transmitter will be maintained during this test.

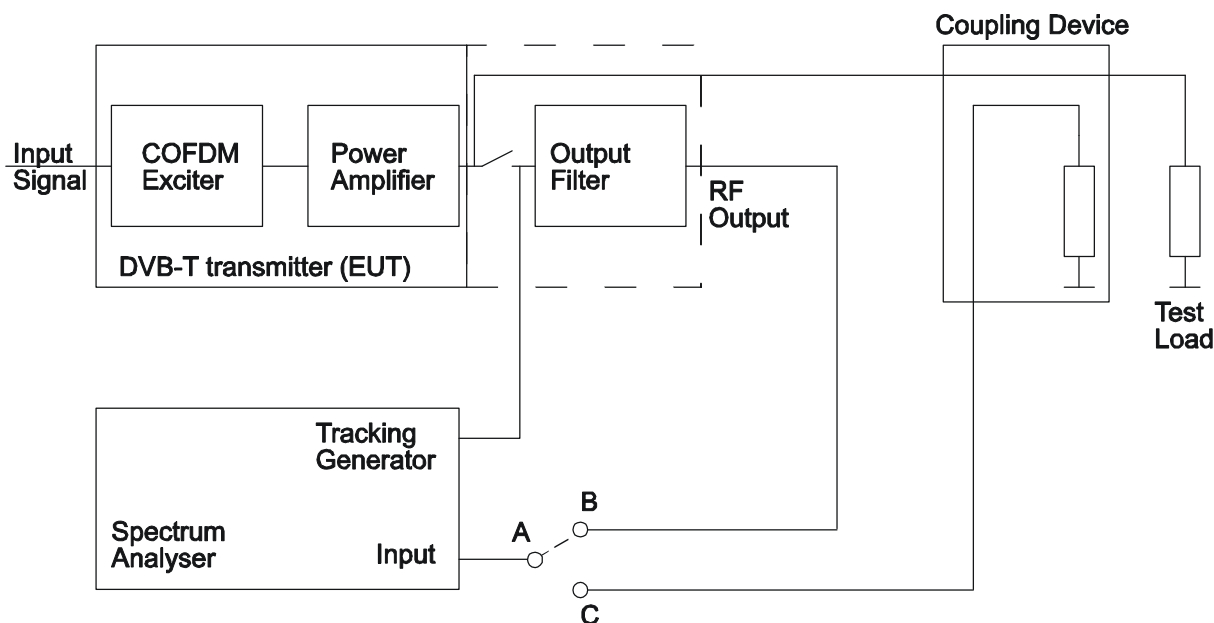
5.4.2.2 Test procedure

- 1) operate the EUT at each of the test frequencies as defined in clause 5.3.2.1;
- 2) measure the results on the spectrum analyser.

5.4.2.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.3.2. in order to demonstrate compliance.

5.4.2.4 Test arrangement



NOTE 1: Disconnect the power amplifier from the output filter.

NOTE 2: The frequency response of the output filter must be measured and recorded (Connection A-B).

NOTE 3: The spectrum of the DVB-T signal at the output of the power amplifier must be measured and recorded (Connection A-C).

NOTE 4: The out-of-band spectrum of the DVB-T signal shall be calculated by applying the recorded frequency response of the output filter to the recorded spectrum of the DVB-T signal.

NOTE 5: If the transmitter does not include any output filter, an external filter shall be added after the transmitter for the testing arrangement. This filter shall be representative of the multiplexer or filter existing in operational conditions and viewed by the transmitted output when installed. In this case, the antenna port measurements shall be performed at the output of this extra filter.

Figure 5.2: Testing arrangement for out-of-band emissions

5.4.3 Cabinet radiation

5.4.3.1 Initial conditions

Test environment:

- the normal operating environment, as declared by the equipment manufacturer.

Test frequencies:

- 1) the lowest operating frequency of the EUT;
- 2) the highest operating frequency of the EUT;
- 3) a frequency mid-way between 1) and 2) above.

Test arrangement:

For the purposes of this test no test signal is required, the manufacturer shall ensure that the full rated output power of the transmitter will be maintained during this test.

5.4.3.2 Test procedure

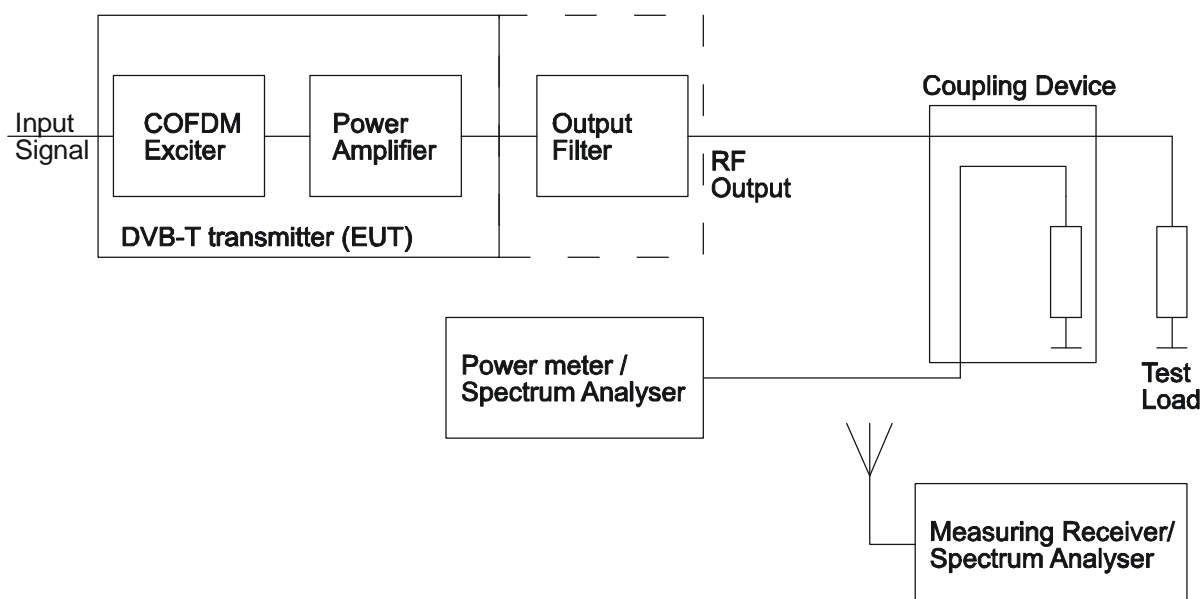
The test method shall be in accordance with EN 55022 [5], unless physical size is a restriction, in which case the test method shall be in accordance with EN 55011 [6]:

- tests shall not be carried out in the exclusion band, which is defined as the allocated channel;
- measurements shall be made in the operational mode producing the largest emission in the frequency band being investigated consistent with normal applications;
- the equipment shall be configured in a manner which is representative of a normal/typical operation, where practical;
- an attempt shall be made to maximize the detected radiated emission, e.g. by moving the cables of the equipment;
- the configuration and mode of operation during measurements shall be precisely noted in the test report;
- RF input/output ports shall be correctly terminated;
- the tests shall be carried out at a point within the specified normal operating environmental range and at the rated supply voltage for the equipment.

5.4.3.3 Test requirements

The results obtained shall be compared to the limits in clause 4.2.4.2 in order to demonstrate compliance.

5.4.3.4 Test arrangement



NOTE: If the transmitter does not include any output filter, an external filter shall be added after the transmitter for the testing arrangement. This filter shall be representative of the multiplexer or filter existing in operational conditions and viewed by the transmitted output when installed.

Figure 5.3: Testing arrangement for cabinet radiation

Annex A (normative):

HS Requirements and conformance Test specifications

Table (HS-RTT)

The HS Requirements and conformance Test specifications Table (HS-RTT) in Table A.1 serves a number of purposes, as follows:

- it provides a statement of all the requirements in words and by cross reference to (a) specific clause(s) in the present document or to (a) specific clause(s) in (a) specific referenced document(s);
- it provides a statement of all the test procedures corresponding to those requirements by cross reference to (a) specific clause(s) in the present document or to (a) specific clause(s) in (a) specific referenced document(s);
- it qualifies each requirement to be either:
 - Unconditional: meaning that the requirement applies in all circumstances; or
 - Conditional: meaning that the requirement is dependent on the manufacturer having chosen to support optional functionality defined within the schedule.
- in the case of Conditional requirements, it associates the requirement with the particular optional service or functionality;
- it qualifies each test procedure to be either:
 - Essential: meaning that it is included with the Essential Radio Test Suite and therefore the requirement shall be demonstrated to be met in accordance with the referenced procedures;
 - Other: meaning that the test procedure is illustrative but other means of demonstrating compliance with the requirement are permitted.

Table A.1: HS Requirements and conformance Test specifications Table (HS-RTT)

Harmonized Standard EN 302 296-2						
The following requirements and test specifications are relevant to the presumption of conformity under the article 3.2 of the R&TTE Directive [2]						
Requirement			Requirement Conditionality		Test Specification	
No	Description	Reference: Clause No	U/C	Condition	E/O	Reference: Clause No
1	Spurious emissions	4.2.2	U		E	5.3.1
2	Out-of-band emissions	4.2.3	U		E	5.3.2
3	Cabinet radiation	4.2.4	U		E	5.3.3

Key to columns:

Requirement:

No A unique identifier for one row of the table which may be used to identify a requirement or its test specification.

Description A textual reference to the requirement.

Clause Number Identification of clause(s) defining the requirement in the present document unless another document is referenced explicitly.

Requirement Conditionality:

U/C Indicates whether the requirement is to be *unconditionally* applicable (U) or is *conditional* upon the manufacturers claimed functionality of the equipment (C).

Condition Explains the conditions when the requirement shall or shall not be applicable for a technical requirement which is classified "conditional".

Test Specification:

E/O Indicates whether the test specification forms part of the Essential Radio Test Suite (E) or whether it is one of the Other Test Suite (O).

NOTE: All tests whether "E" or "O" are relevant to the requirements. Rows designated "E" collectively make up the Essential Radio Test Suite; those designated "O" make up the Other Test Suite; for those designated "X" there is no test specified corresponding to the requirement. The completion of all tests classified "E" as specified with satisfactory outcomes is a necessary condition for a presumption of conformity. Compliance with requirements associated with tests classified "O" or "X" is a necessary condition for presumption of conformity, although conformance with the requirement may be claimed by an equivalent test or by manufacturer's assertion supported by appropriate entries in the technical construction file.

Clause Number Identification of clause(s) defining the test specification in the present document unless another document is referenced explicitly. Where no test is specified (that is, where the previous field is "X") this field remains blank.

Annex B (informative): The EN title in the official languages

The enlargement of the European Union (EU) resulted in a requirement from the EU for a larger number of languages for the translation of the titles of Harmonized Standards and mandated ENs that are to be listed in the Official Journal to support the implementation of this legislation.

For this reason the title translation concerning the present document can be consulted via the [e-approval](#) application.

Annex C (informative): Bibliography

Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive).

Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (LV Directive).

Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC (EMC Directive).

Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (LV Directive).

IEC 60489-1 + Am1 (1996) + Am2 (1999): "Methods of measurement for radio equipment used in the mobile services. Part 1: General definitions and standard conditions of measurement".

The Chester 1997 Multilateral Co-ordination Agreement Relating to Technical Criteria, Co-ordination Principles and Procedures for the Introduction of Terrestrial Digital Video Broadcasting (DVB-T) Chester, 25th July 1997 Resolution 5.

CEPT/ERC Recommendation 74-01: "Spurious emissions".

ITU-R Recommendation SM.329-10: "Unwanted emissions in the spurious domain".

ITU-R Recommendation SM.328-10: "Spectra and bandwidth of emissions".

ITU-R Recommendation SM.1541-1: "Unwanted emissions in the out-of-band domain".

ETSI ETR 290: "Digital Video Broadcasting (DVB); Measurement guidelines for DVB systems".

IEC 60244-1: "Methods of measurement for radio transmitters - Part 1: General characteristics for broadcast transmitters".

IEC 60244-6: "Methods of measurement for radio transmitters - Part 6: Cabinet radiation at frequencies between 130 kHz and 1 GHz".

IEC 61000-4-3/Am1 (2002): "Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test".

ETSI TR 101 190: "Digital Video Broadcasting (DVB); Implementation guidelines for DVB terrestrial services; Transmission aspects".

History

Document history		
V1.1.1	January 2005	Publication as EN 302 296
V1.2.1	July 2010	Public Enquiry PE 20101110: 2010-07-13 to 2010-11-10
V1.2.1	March 2011	Vote V 20110514: 2011-03-15 to 2011-05-16