



**ElectroMagnetic Compatibility (EMC) standard
for marine radio equipment and services;
Harmonised Standard covering the essential requirements for
electromagnetic compatibility;
of article 3.1b of the Directive 2014/53/EU;
Part 2: Specific conditions for VHF radiotelephone
transmitters and receivers**

Reference

REN/ERM-EMC-~~348386~~

Keywords

EMC, harmonised standard, maritime, radio,
regulation, VHF

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

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 only prevailing document is the print of the Portable Document Format (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

<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/CommiteeSupportStaff.aspx>

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 2017.

All rights reserved.

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 protected for the benefit of its Members.

GSM® and the GSM logo are trademarks registered and owned by the GSM Association.

Contents

Intellectual Property Rights	5
Foreword.....	5
Modal verbs terminology	5
1 Scope	6
2 References	6
2.1 Normative references	6
2.2 Informative references	6
3 Definitions, symbols and abbreviations	7
3.1 Definitions	7
3.2 Symbols	7
3.3 Abbreviations.....	7
4 General and operational requirements.....	7
4.1 Environmental profile	7
4.2 Arrangements for test signals.....	8
4.2.0 General	8
4.2.1 Arrangements for test signals at the input of the transmitter	8
4.2.2 Arrangements for test signals at the output of the transmitter.....	8
4.2.3 Arrangements for test signals at the input of the receiver	8
4.2.4 Arrangements for test signals at the output of the receiver	8
4.2.5 Arrangements for testing transmitter and receiver together (as a system).....	8
4.3 Exclusion bands	8
4.3.0 General	8
4.3.1 Exclusion bands for receivers and receiver parts of transceivers	8
4.3.2 Exclusion band for transmitters.....	9
4.4 Narrow band responses on receivers.....	9
4.5 Normal test modulation	9
5 Performance assessment.....	9
5.1 General.....	9
5.2 Equipment which can provide a continuous communication link	9
5.3 Equipment which does not provide a continuous communication link.....	9
5.4 Ancillary equipment	9
5.5 Equipment classification	10
6 Performance criteria	10
6.0 General.....	10
6.1 Performance criteria A for continuous phenomena applied to transmitters and receivers	10
6.2 Performance criteria B for transient phenomena applied to transmitters and receivers	10
6.3 Performance criteria C applied to power supply failure	10
6.4 Performance check.....	10
6.4.0 General	10
6.4.1 Transmitter	10
6.4.2 Receiver	11
6.5 Performance criteria for equipment which does not provide a continuous communication link	11
6.6 Performance criteria for ancillary equipment tested on a stand-alone basis	11
7 Applicability overview	11
7.1 Emission	11
7.1.1 General	11
7.1.2 Special conditions	11
7.2 Immunity	11
7.2.1 General	11
7.2.2 Special conditions	12

Annex A (informative):	Relationship between the present document and the essential requirements of Directive 2014/53/EU	13
Annex B (informative):	Examples of types of marine radiotelephone equipment in the scope of the present document	15
B.1	Radiotelephone transmitters and receivers for the maritime mobile service operating in the VHF bands	15
Annex C (informative):	Bibliography.....	16
Annex D (informative):	Change history	17
History		18

Intellectual Property Rights

Essential patents

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 (<https://ipr.etsi.org/>).

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.

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.

Foreword

This Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [1.7] 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.2].

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 of ~~ETSI EN 301 843-1 [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 2 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

National transposition dates	
Date of adoption of this EN:	17 October 2017
Date of latest announcement of this EN (doa):	31 January 2018
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 July 2018
Date of withdrawal of any conflicting National Standard (dow):	31 July 2019

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.

1 Scope

The present document together with ETSI EN 301 843-1 [1], covers the assessment of VHF radiotelephone transmitters and receivers for the maritime mobile service, and ancillary equipment in respect of ElectroMagnetic Compatibility (EMC).

Technical specifications related to the antenna port and emissions from the enclosure port of marine radiotelephone transmitters and receivers are not included in the present document. Such technical specifications are found in the related product standards for the effective use of the radio spectrum.

The present document specifies the applicable test conditions, performance assessment, and performance criteria for VHF radiotelephone transmitters and receivers for the maritime mobile service, and the associated ancillary equipment.

Examples of types of radiotelephone transmitters and receivers for the maritime mobile service covered by the present document are given in annex A.

In case of differences (for instance concerning special conditions, definitions, abbreviations) between the present document and ETSI EN 301 843-1 [1], the provisions of the present document take precedence.

The electromagnetic environment used in the present document to develop the technical specifications encompasses the electromagnetic environment on-board ships as identified in ~~CENELEC~~ IEC EN 60945 [i.5].

NOTE: The relationship between the present document and essential requirements of article 3.1b of Directive 2014/53/EU [i.2] 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/>.

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 301 843-1 (V2.2.1-1) (~~03-2016~~) (11-2017): "ElectroMagnetic Compatibility (EMC) standard for marine radio equipment and services; Harmonised Standard covering the essential requirements of article 3.1b of the Directive 2014/53/EU; Part for electromagnetic compatibility; Part 1: Common technical 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] Void.

- [i.2] 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.3] Void.
- [i.4] ETSI EN 302 885-~~(2.1.1)~~ ~~(03-2016)~~; "Portable Very High Frequency (VHF) radiotelephone equipment for the maritime mobile service operating in the VHF bands with integrated handheld class ~~DH~~ DSC; Harmonised Standard covering the essential requirements of articles 3.2 and 3.3(g) of ~~the~~ Directive 2014/53/EU".
- [i.5] ~~CENELEC~~ IEC EN 60945: (2002) + Corrigendum 1 (2008): "Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results".
- [i.6] ETSI EN 301 025-~~(V2.1.1)~~ ~~(12-2015)~~; "VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC); Harmonised Standard covering the essential requirements of articles 3.2 and 3.3(g) of the Directive 2014/53/EU".
- [i.7] 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 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI EN 301 843-1 [1] apply.

3.2 Symbols

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

emf	electromotive force
rms	root mean square
SINAD	(Signal + Noise + Distortion) / (Noise + Distortion)

3.3 Abbreviations

For the purposes of the present document, the ~~following~~ abbreviations given in ETSI EN 301 843-1 [1] and the following apply:

EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
RF	Radio Frequency

4 General and operational requirements

4.1 Environmental profile

The provisions of ETSI EN 301 843-1 [1], clause 4.1 shall apply with the following modifications.

For emission and immunity tests the normal test modulation, test arrangements, etc., as specified in the present document, clauses 4.1 to 4.5, shall apply.

The test shall be carried out at a point within the specified normal operating environmental range of temperature and humidity with the equipment connected to the normal power supply voltage.

4.2 Arrangements for test signals

4.2.0 General

The provisions of ETSI EN 301 843-1 [1], clause 4.2 shall apply.

4.2.1 Arrangements for test signals at the input of the transmitter

The provisions of ETSI EN 301 843-1 [1], clause 4.2.1 shall apply.

4.2.2 Arrangements for test signals at the output of the transmitter

The provisions of ETSI EN 301 843-1 [1], clause 4.2.2 shall apply.

4.2.3 Arrangements for test signals at the input of the receiver

The provisions of ETSI EN 301 843-1 [1], clause 4.2.3 shall apply with the following modifications.

The wanted RF input signal, coupled to the receiver, shall be modulated with normal test modulation as specified for that type of equipment (see clause 4.5).

The level of the wanted signal shall be 40 dB μ V (emf) unless indicated otherwise.

4.2.4 Arrangements for test signals at the output of the receiver

The provisions of ETSI EN 301 843-1 [1], clause 4.2.4 shall apply as appropriate.

4.2.5 Arrangements for testing transmitter and receiver together (as a system)

The provisions of ETSI EN 301 843-1 [1], clause 4.2.5 shall apply as appropriate.

4.3 Exclusion bands

4.3.0 General

The provisions of ETSI EN 301 843-1 [1], clause 4.3 shall apply as appropriate.

The emission measurement and immunity test exclusions are referred to as "exclusion bands" and are defined in the clauses 4.3.1 and 4.3.2.

4.3.1 Exclusion bands for receivers and receiver parts of transceivers

The exclusion band for marine radiotelephone receivers and receivers of transceivers is the frequency range determined by the switching range, as declared by the manufacturer, extended as follows:

- the lower frequency of the exclusion band is the lower frequency of the switching range, minus 5 % of the centre frequency of the switching range, or minus 10 MHz, whichever will result in the lowest frequency;
- the upper frequency of the exclusion band is the upper frequency of the switching range, plus 5 % of the centre frequency of the switching range, or plus 10 MHz, whichever will result in the highest frequency.

The switching range is the maximum frequency range over which the receiver can be operated without reprogramming or realignment.

4.3.2 Exclusion band for transmitters

The exclusion band for marine radiotelephone transmitters extends ± 50 kHz from the nominal operating frequency of the transmitter.

4.4 Narrow band responses on receivers

The provisions of ETSI EN 301 843-1 [1], clause 4.4 shall apply with the following modifications.

No immunity tests shall be carried out on frequencies of identified narrow band responses on marine radiotelephone receivers or the receiver part of transceivers.

A reduction of the SINAD below 20 dB in the measured value of the speech output signal level shall be used as criterion for the identification of any unwanted responses.

The nominal frequency offset to be used for the identification of narrowband responses shall be ± 50 kHz for the first part of the identification procedure, and $\pm 62,5$ kHz for its second part.

All narrowband responses shall be disregarded from immunity tests.

4.5 Normal test modulation

The normal test modulation shall be as follows:

- the transmitter shall be modulated with a sinusoidal audio frequency of 1 000 Hz and the frequency deviation shall be ± 3 kHz;
- the wanted RF input signal shall be set to the nominal frequency of the receiver modulated with a sinusoidal audio frequency of 1 000 Hz and a frequency deviation of ± 3 kHz.

5 Performance assessment

5.1 General

The provisions of ETSI EN 301 843-1 [1], clause 5.1 shall apply.

5.2 Equipment which can provide a continuous communication link

The provisions of ETSI EN 301 843-1 [1], clause 5.2 shall apply.

5.3 Equipment which does not provide a continuous communication link

The provisions of ETSI EN 301 843-1 [1], clause 5.3 shall apply.

5.4 Ancillary equipment

The provisions of ETSI EN 301 843-1 [1], clause 5.4 shall apply.

5.5 Equipment classification

Radiotelephone transmitters and receivers may belong to either the category of mobile or portable marine radio equipment.

6 Performance criteria

6.0 General

The provisions of ETSI EN 301 843-1 [1], clause 6 shall apply.

The equipment shall meet the special performance criteria set out in clauses 6.1 to 6.4, as appropriate.

6.1 Performance criteria A for continuous phenomena applied to transmitters and receivers

The provisions of ETSI EN 301 843-1 [1], clause 6.1 shall apply.

6.2 Performance criteria B for transient phenomena applied to transmitters and receivers

The provisions of ETSI EN 301 843-1 [1], clause 6.2 shall apply with the following modifications.

During the test sequence, degradation or loss of function or performance which is self-recoverable is allowed, but the EUT shall not unintentionally transmit or change actual operating state or stored data.

6.3 Performance criteria C applied to power supply failure

The provisions of ETSI EN 301 843-1 [1], clause 6.3 shall apply.

6.4 Performance check

6.4.0 General

The provisions of ETSI EN 301 843-1 [1], clause 6.4 shall apply with the modifications set out in clauses 6.4.1 and 6.4.2.

6.4.1 Transmitter

For the purpose of the present document, a "performance check" of the transmitter is taken to mean a measurement of:

- RF output power;
- frequency error;
- SINAD of the demodulated output signal.

The transmitter shall be connected to an artificial antenna.

The RF output signal shall be connected via an appropriate coupling device to a linear demodulator with a de-emphasis network of 6 dB/octave.

With the output power switch set at maximum:

- the RF output carrier power shall be between 6 W and 25 W;
- the frequency error of the unmodulated carrier shall be within $\pm 1,5$ kHz;
- with normal test modulation (see clause 4.5), the SINAD of the demodulated output signal shall be 20 dB or better.

6.4.2 Receiver

For the purpose of the present document a "performance check" of the receiver is taken to mean a measurement of the receiver's SINAD with a test signal at a carrier frequency equal to the nominal frequency of the receiver modulated by the normal test modulation (see clause 4.5) applied to the receiver antenna input.

An audio frequency load and measuring instrument for measuring the SINAD shall be connected to the receiver output terminal using a fixed RF input level of 40 dB μ V (emf).

The level of measured SINAD shall be at least 20 dB with the receiver's audio frequency power control adjusted to produce 50 % of the rated output power.

6.5 Performance criteria for equipment which does not provide a continuous communication link

The provisions of ETSI EN 301 843-1 [1], clause 6.5 shall apply.

6.6 Performance criteria for ancillary equipment tested on a stand-alone basis

The provisions of ETSI EN 301 843-1 [1], clause 6.6 shall apply.

7 Applicability overview

7.1 Emission

7.1.1 General

ETSI EN 301 843-1 [1], table 1, contains the applicability of EMC emission measurements to the relevant ports of marine radio and/or associated ancillary equipment.

7.1.2 Special conditions

No special conditions shall apply to marine radiotelephone transmitters and receivers in the scope of the present document.

7.2 Immunity

7.2.1 General

ETSI EN 301 843-1 [1], table 2, contains the applicability of EMC immunity measurements to the relevant ports of marine radio and/or associated ancillary equipment.

7.2.2 Special conditions

The following special conditions set out in table 1, ~~relate~~ shall apply in addition to the immunity test methods and performance criteria used in ETSI EN 301 843-1 [1], clause 9.

Table 1: Special conditions for EMC immunity tests

Reference to clauses in ETSI EN 301 843-1 [1]	Special product-related conditions, additional to or modifying the test conditions in ETSI EN 301 843-1 [1], clause 9
9.2.2: Test method; Radio frequency electromagnetic field	Wanted RF input signal for the receiver under test: A receiver RF input level of 40 dB μ V (emf) shall be used during the test.
9.5.2: Test method; Radio frequency, Common mode	Wanted RF input signal for the receiver under test: A receiver RF input level of 40 dB μ V (emf) shall be used during the test.

Annex A (normative/informative): Relationship between the present document and the essential requirements of Directive 2014/53/EU

The provisions of ETSI EN 301 843-1 [1], annex A shall apply.

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.7] 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.2].

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.

**Table A.1: Relationship between the present document and
the essential requirements of Directive 2014/53/EU**

Harmonised Standard ETSI EN 301 843-2					
Requirement				Requirement Conditionality	
No	Description	Essential requirements of Directive	Clause(s) of the present document	U/C	Condition
1	Emission: Enclosure of ancillary equipment measured on a stand alone basis	3.1b	8.2 of ETSI EN 301 843-1 [1]	U	
2	Emission: DC power input/output ports	3.1b	8.3 of ETSI EN 301 843-1 [1]	C	DC powered equipment with cables > 3 m
3	Emission: AC mains power input/output ports	3.1b	8.4 of ETSI EN 301 843-1 [1]	C	AC powered equipment
4	Immunity: Radio frequency electromagnetic field (80 MHz to 2.7 GHz)	3.1b	9.2 of ETSI EN 301 843-1 [1] and 7.2.2	U	
5	Immunity: Electrostatic discharge	3.1b	9.3 of ETSI EN 301 843-1 [1]	U	
6	Immunity: Fast transients, differential and common mode AC ports	3.1b	9.4 of ETSI EN 301 843-1 [1]	C	AC powered equipment
7	Immunity: Fast transients, differential and common mode DC ports	3.1b	9.4 of ETSI EN 301 843-1 [1]	C	DC powered equipment with cables > 3 m
8	Immunity: Fast transients, differential and common mode Signal and control ports	3.1b	9.4 of ETSI EN 301 843-1 [1]	C	Cables > 3 m
9	Immunity: Radio frequency, common mode AC ports	3.1b	9.5 of ETSI EN 301 843-1 [1]	C	AC powered equipment
10	Immunity: Radio frequency, common mode DC ports	3.1b	9.5 of ETSI EN 301 843-1 [1] and 7.2.2	C	DC powered equipment with cables > 3 m
11	Immunity: Radio frequency, common mode signal and control ports	3.1b	9.5 of ETSI EN 301 843-1 [1] and 7.2.2	C	Cables > 3 m
12	Immunity: Power supply short term variations	3.1b	9.6.1 of ETSI EN 301 843-1 [1]	C	AC powered equipment
13	Immunity: Power supply failure	3.1b	9.6.2 of ETSI EN 301 843-1 [1]	C	Not for battery powered or equipment with back-up batteries
14	Immunity: Surges	3.1b	9.7 of ETSI EN 301 843-1 [1]	C	AC powered equipment

Key to columns:**Requirement:**

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

Description A textual reference to the requirement.

Essential requirements of Directive

Identification of article(s) defining the requirement in the Directive.

Clause(s) of the present document

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 unconditionally applicable (U) or is conditional upon the manufacturer's claimed functionality of the equipment (C).

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

Presumption of conformity stays valid only as long as a reference to the present document is maintained in the list published in the Official Journal of the European Union. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union.

Other Union legislation may be applicable to the product(s) falling within the scope of the present document.

Annex B (informative): Examples of types of marine radiotelephone equipment in the scope of the present document

~~B.0~~ — General

~~The provisions of the present document apply to radiotelephone transmitters and receivers intended for operation in the maritime mobile service, and associated ancillary equipment, as set out in the following clauses.~~

B.1 Radiotelephone transmitters and receivers for the maritime mobile service operating in the VHF bands

The present document applies to radiotelephone transmitters and receivers for use on-board ships and operating in the maritime VHF bands in the frequency range 156 MHz to 174 MHz, and the associated ancillary equipment as defined in, for example, ETSI EN 302 885 [i.4] and ETSI EN 301 025 [i.6].

Annex C (informative): Bibliography

- Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.
- 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.

Annex D (informative): Change history

<u>Version</u>	<u>Information about changes</u>
<u>2.1.1</u>	<u>First version under the Radio Equipment Directive</u>

History

Document history		
V1.1.1	February 2001	Publication
V1.2.1	June 2004	Publication
V2.1.0	December 2015	EN Approval Procedure AP 20160321: 2015-12-22 to 2016-03-21
V2.1.1	March 2016	Publication
<u>V2.2.0</u>	<u>July 2017</u>	<u>EN Approval Procedure AP 20171017: 2017-07-19 to 2017-10-17</u>
<u>V2.2.1</u>	<u>November 2017</u>	<u>Publication</u>