

ETSI EN 301 843-5 V2.1.1 (2016-03)



HARMONISED EUROPEAN STANDARD

**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 5: Specific conditions for MF/HF radiotelephone
transmitters and receivers**

Reference

REN/ERM-EMC-350

Keywords

EMC, harmonised standard, HF, maritime, MF,
radio, receiver

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.

© European Telecommunications Standards Institute 2016.
All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.
3GPP™ and **LTE™** are Trade Marks of ETSI 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
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
4.6 Artificial Antennae (non-radiating test load).....	9
5 Performance assessment.....	10
5.1 General	10
5.2 Equipment which can provide a continuous communication link	10
5.3 Equipment which does not provide a continuous communication link	10
5.4 Ancillary equipment	10
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	11
6.3 Performance criteria C applied to power supply failure	11
6.4 Performance check	11
6.4.0 General.....	11
6.4.1 Transmitter.....	11
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	12
7 Applicability overview	12
7.1 Emission	12
7.1.1 General.....	12
7.1.2 Special conditions	12
7.2 Immunity	12
7.2.1 General.....	12
7.2.2 Special conditions	12

Annex A (normative):	Relationship between the present document and the essential requirements of Directive 2014/53/EU	13
Annex B (informative):	Examples of types of MF/HF marine radiotelephone equipment in the scope of the present document.....	14
B.0	General	14
B.1	Radiotelephone transmitters and receivers for the maritime mobile service operating in the MF/HF bands.....	14
History	15

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 (<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.

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 [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 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 5 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:	21 March 2016
Date of latest announcement of this EN (doa):	30 June 2016
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 December 2016
Date of withdrawal of any conflicting National Standard (dow):	31 December 2017

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 MF/HF 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 radiotelephone transmitters and receivers for the maritime mobile service and the associated ancillary equipment.

Examples of types of MF/HF 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 EN 60945 [i.3].

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 <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.

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

- [1] ETSI EN 301 843-1 (V2.1.1) (03-2016): "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 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] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC.
- [i.2] ETSI EN 300 373-2 (V1.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Maritime mobile transmitters and receivers for use in the MF and HF bands; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE directive".

- [i.3] CENELEC EN 60945 (2002) + Corrigendum 1 (2008): "Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results".
- [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 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] and the following apply:

standard output power (audio): (of the receiver) is defined as:

- a) 1 mW for earphone reception;
- b) 500 mW for loudspeaker reception;
- c) 0 dBm (1mW) into 600 Ω for the audio line outputs.

3.2 Symbols

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

emf	electromotive force
F1B	Frequency modulation, single channel containing quantized or digital information with the use of a modulating sub-carrier, telegraphy for automatic reception.
J3E	Single Sideband, suppressed carrier, single channel containing analogue information, telephony
rms	root mean square
SINAD	(Signal + Noise + Distortion) / (Noise + Distortion)

3.3 Abbreviations

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

AGC	Automatic Gain Control
DSC	Digital Selective Calling
EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
HF	High Frequency
MF	Medium Frequency
MF/HF	Medium Frequency/High Frequency
PEP	Peak Envelope Power
RF	Radio Frequency
SINAD	Signal-to-noise and distortion ratio

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 as follows:

MF (1 605 kHz to 4 000 kHz) J3E Mode: +56 dBuV F1B Mode: +45 dBuV

HF (4 MHz to 27,5 MHz) J3E Mode: +51 dBuV F1B Mode: +40 dBuV

Measurements shall only be made in F1B mode where the EUT does not have J3E mode.

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 the criterion for the identification of any unwanted responses.

The nominal frequency offset to be used for the identification of narrowband responses shall be ± 8 kHz for the first part of the identification procedure and ± 10 kHz for its second part.

All narrowband responses shall be disregarded from immunity tests.

4.5 Normal test modulation

Receive: The normal test modulation shall be as follows:

Class of emission J3E

Unmodulated signal, 1 000 Hz ($\pm 0,1$ Hz) above the carrier frequency to which the receiver is tuned.

Class of emission F1B

DSC with an analogue interface, unmodulated signal on the assigned frequency.

DSC with a digital interface, a signal on the assigned frequency, modulated as appropriate.

Frequency shift signal with ± 85 Hz shift at 1 700 Hz with a 100 Baud pseudo random bit pattern.

Transmit: The normal test modulation shall be as follows:

Class of emission J3E

- the transmitter shall be modulated with a signal of 1 000 Hz $\pm 0,1$ Hz. The 1 000 Hz signal shall be subtracted from the measured frequency to get the transmitter frequency.

Class of emission F1B with an analogue interface:

- the transmitter shall be modulated with a signal of 1 700 Hz $\pm 0,1$ Hz.

Class of emission F1B with a digital interface:

- the digital input shall first be connected to a digital 0 and then to a digital 1.

4.6 Artificial Antennae (non-radiating test load)

Transmitters:

For the purpose of conformance testing, the transmitter, at the output of the antenna matching device, shall meet the requirements of the present document when connected to the artificial antennae listed below:

- frequency range 1 605 kHz to 4 000 kHz:
 - the artificial antenna shall consist of a resistance of 10 Ω and a capacitance of 250 pF connected in series;

- frequency range 4 MHz to 27,5 MHz:
 - the artificial antenna shall consist of a resistance of 50 Ω .

Receivers:

For the purpose of conformance testing, the receiver shall meet the requirements of the present document when connected to a test source, at the point at which the antenna is normally connected, having the following characteristics:

- the test signal shall be derived from a resistive source of 50 Ω except as permitted below:
 - alternatively, in the frequency range 1 605 kHz to 4 000 kHz, an artificial antenna consisting of a 10 Ω resistor in series with a 250 pF capacitor may be used.

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 belong solely to the category of mobile 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, the term "performance check" shall be taken to mean the following measurements and limits:

- frequency error:
 - With the transmitter connected to an artificial antenna (see clause 4.6), the transmitter shall be tuned to the frequency 2 182 kHz for MF equipment or 8 291 kHz for MF/HF equipment and operated in J3E mode and shall be modulated with a signal of 1 000 Hz \pm 0,1 Hz. The 1 000 Hz signal shall be subtracted from the measured frequency to get the transmitter frequency. The transmitter frequency shall be within \pm 10 Hz of the selected frequency.
- RF output power:
 - With the transmitter connected to an artificial antenna (see clause 4.6), the transmitter shall be tuned to the frequency 2 182 kHz for MF equipment or 8 291 kHz for MF/HF equipment and operated in J3E mode. The transmitter shall be modulated by a test signal consisting of two audio frequency tones, applied simultaneously to the microphone input, at frequencies of 1 100 Hz and 1 700 Hz. The level of the tones shall be adjusted so that they produce equal output power and it shall be possible to obtain an output power of greater than 60 W PEP.

6.4.2 Receiver

For the purpose of the present document, the term "performance check" shall be taken to mean the following measurements and limits:

- maximum usable sensitivity:
 - With the AGC operative, the receiver shall be adjusted to 2 182 kHz for MF equipment or 8 291 kHz for MF/HF equipment and operated in J3E mode. A test signal as specified in clause 4.5 shall be applied. The level of the input signal shall be adjusted until the SINAD at the audio output of the receiver is 20 dB, and the output power is at least the standard output power (see clause 3.1). The level of the input signal shall be not greater than +22 dB μ V at 2 182 kHz or not greater than +17 dB μ V at 8 291 kHz.

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 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 as specified in clause 4.2.3 with normal test modulation (see clause 4.5) 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 as specified in clause 4.2.3 with normal test modulation (see clause 4.5) shall be used during the test.

Annex A (normative): 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.

Annex B (informative): Examples of types of MF/HF 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 clause.

B.1 Radiotelephone transmitters and receivers for the maritime mobile service operating in the MF/HF bands

The present document applies to radiotelephone transmitters and receivers for fixed installation on-board ships and operating in the maritime MF and/or HF bands in the frequency range 1 605 kHz to 27,5 MHz and the associated ancillary equipment as defined in ETSI EN 300 373-2 [i.2].

History

Document history		
V1.1.1	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