

# ETSI EN 301 843-5 V2.2.1 (2017-11)



**ElectroMagnetic Compatibility (EMC) standard  
for marine radio equipment and services;  
Harmonised Standard for electromagnetic compatibility;  
Part 5: Specific conditions for MF/HF radiotelephone  
transmitters and receivers**

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**Reference**REN/ERM-EMC-388

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F-06921 Sophia Antipolis Cedex - FRANCE

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

Siret N° 348 623 562 00017 - NAF 742 C  
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## 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 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:	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

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## Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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# 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 IEC EN 60945 [i.3].

NOTE: The relationship between the present document and essential requirements of article 3.1b of Directive 2014/53/EU [i.1] is given in annex A.

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## 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.

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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) (11-2017): "ElectroMagnetic Compatibility (EMC) standard for marine radio equipment and services; Harmonised Standard 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] 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 303 402 (V2.1.1): "Maritime mobile transmitters and receivers for use in the MF and HF bands; Harmonised Standard covering the essential requirements of articles 3.2 and 3.3(g) of Directive 2014/53/EU".
- [i.3] IEC 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 (1 mW) into 600  $\Omega$  for the audio line outputs.

### 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 abbreviations given in ETSI EN 301 843-1 [1] and the following apply:

AGC	Automatic Gain Control
DSC	Digital Selective Calling
EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
F1B	Frequency modulation

NOTE: Single channel containing quantized or digital information with the use of a modulating sub-carrier, telegraphy for automatic reception.

HF	High Frequency
J3E	Single Sideband

NOTE: Suppressed carrier, single channel containing analogue information, telephony.

MF	Medium Frequency
MF/HF	Medium Frequency/High Frequency
PEP	Peak Envelope Power
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 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  $\pm 50$  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  $\pm 8$  kHz for the first part of the identification procedure and  $\pm 10$  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  $\pm 85$  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  $\Omega$  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  $\Omega$ .

### 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  $\Omega$  except as permitted below:
  - alternatively, in the frequency range 1 605 kHz to 4 000 kHz, an artificial antenna consisting of a 10  $\Omega$  resistor in series with a 250 pF capacitor may be used.

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## 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.

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# 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 $\mu$ V at 2 182 kHz or not greater than +17 dB $\mu$ 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.

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# 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
<b>9.2.2: Test method; Radio frequency electromagnetic field</b>	<b>Wanted RF input signal for the receiver under test:</b> 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.
<b>9.5.2: Test method; Radio frequency, Common mode</b>	<b>Wanted RF input signal for the receiver under test:</b> 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 (informative): Relationship between the present document and the essential requirements of Directive 2014/53/EU

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.4] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.1].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A.1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

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

Harmonised Standard ETSI EN 301 843-5					
Requirement				Requirement Conditionality	
No	Description	Essential requirements of Directive	Clause(s) of the present document	U/C	Condition
1	Emmission: Enclosure of ancillary equipment measured on a stand alone basis	3.1b	8.2 of ETSI EN 301 843-1 [1]	U	
2	Emmission: 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	Emmission: 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.

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

### 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 303 402 [i.2].



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## Annex C (informative): Change history

Version	Information about changes
2.1.1	First version under the Radio Equipment Directive

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## History

<b>Document history</b>		
V1.1.1	June 2004	Publication
V2.1.1	March 2016	Publication
V2.2.0	July 2017	EN Approval Procedure AP 20171017: 2017-07-19 to 2017-10-17
V2.2.1	November 2017	Publication