

Final draft **ETSI EN 302 608** V2.1.1 (2017-09)



**HARMONISED EUROPEAN STANDARD**

**Short Range Devices (SRD);  
Radio equipment for Eurobalise railway systems;  
Harmonised Standard covering the essential requirements  
of article 3.2 of Directive 2014/53/EU**

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Reference

REN/ERM-TG28-520

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**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

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## Foreword

This final draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the Vote phase of the ETSI standards EN Approval Procedure.

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.8] 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.

<b>Proposed national transposition dates</b>	
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

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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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# 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 Directive 2014/53/EU [i.1].

The Eurobalise transmission system is defined by the specifications [1] and [2] of the UNISIG consortium.

# 1 Scope

The present document specifies technical characteristics and methods of measurements for radio transmitters and receivers used in the Eurobalise transmission system. The system is used in railway environment for the communication between tracks and trains.

It applies to the following equipment units:

- a) the On-Board Equipment (OBE) Tele-powering the Eurobalise; and
- b) the Eurobalise that is always installed in between the rails.

The OBE comprises a transmitter (normally un-modulated) and a receiver fitted with an integral or dedicated antenna.

The Eurobalise FSK-modulated transmitter is Tele-powered by the OBE and has an integral antenna.

The Eurobalise transmission system operates in frequency bands listed in table 1 in accordance with the EC Decision 2013/752/EU [i.5] and ERC Recommendation 70-03 [i.2], annex 4.

These radio equipment types are capable of operating at the following frequencies as given in table 1.

**Table 1: Radio communications frequencies**

	<b>Radio communications frequencies</b> <b>Note</b>
OBE receive frequency band	2,5 MHz to 6 MHz (4,234 MHz centre frequency)
Eurobalise transmit frequency band	4,234 MHz $\pm$ 1 MHz

NOTE: EC decision for SRDs [i.5] and ERC Rec 70-03 [i.2] are providing the usage conditions for Eurobalise transmissions in frequency range 984 - 7 484 kHz (4,234 MHz centre frequency). The 27 MHz band is only used in the OBE for telepowering the Eurobalise, which is not in the scope of the present document.

The present document covers the essential requirements of article 3.2 of Directive 2014/53/EU [i.1] under the conditions identified 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] UNISIG SUBSET-036-3.1.0: "FFFIS for Eurobalise", December 2015.

NOTE: Available at <http://www.era.europa.eu/Document-Register/Documents/SUBSET-036%20v310.pdf>.

[2] UNISIG SUBSET-085-3.0.0: "Test Specification for Eurobalise FFFIS", February 2012.

NOTE: Available at <http://www.era.europa.eu/Document-Register/Documents/Set-2-Index043-SUBSET-085%20v300.pdf>.

## 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] CEPT/ERC/Recommendation 70-03: "Relating to the use of Short Range Devices (SRD)".
- [i.3] ETSI TR 100 028 (V1.4.1) (12-2001) (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [i.4] ETSI TR 102 273 (V1.2.1) (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties".
- [i.5] EC Decision 2013/752/EU: "Commission Implementing DECISION of 11 December 2013 amending Decision 2006/771/EC on harmonisation of the radio spectrum for use by short-range devices and repealing Decision 2005/928/EC".
- [i.6] ETSI EN 300 330 (V2.1.1): "Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU".
- [i.7] CENELEC EN 50121-2:2015: "Railway applications - Electromagnetic compatibility - Part 2: Emission of the whole railway system to the outside world". Applies in conjunction with EN 50121-1 (09-2000).
- [i.8] 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.
- [i.9] UNISIG SUBSET-116-1.1.0: "Eurobalise On-board Equipment, Susceptibility Test Specification", June 2016.

NOTE: Available at <http://www.era.europa.eu/Document-Register/Pages/Set-3-Eurobalise-On-board-equipment-susceptibility-test-specification.aspx>.

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## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

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

**dedicated antenna:** removable antenna supplied and tested with the radio equipment, designed as an indispensable part of the equipment

**duty cycle:** defined as the ratio, expressed as a percentage, of the maximum transmitter "on" time monitored over one hour, relative to a one hour period



**Eurobalise:** wayside transmission unit that uses the magnetic transponder technology

NOTE: Its main function is to transmit and/or receive signals through the air gap. The Eurobalise is a single device mounted on the track, which communicates with a train passing over it.

**integral antenna:** permanent fixed antenna, which may be built-in, designed as an indispensable part of the equipment

**intersystem interference:** interference from sources not under the control of the operator or manufacturer of the equipment

**intrasystem interference:** interference from source that are part of the system and are under the control of the manufacturer or the operator of the equipment

**magnetic transponder technology:** method that uses magnetic coupling in the air gap between a transmitter and a receiver for conveying data and energy

NOTE: In the Eurobalise transmission system context, it considers systems using the 27,095 MHz for Tele-powering and 4,234 MHz for Up-link transmission.

**On-Board Equipment (OBE):** part of the inductive communication system installed on the train

NOTE: The OBE consists of antenna unit(s) for the communication between the train and the Eurobalise.

**tele-powering:** signal transmitted by the OBE, which activates the Eurobalise upon passage

NOTE: The signal is normally an un-modulated RF carrier (CW).

**up-link:** transmission link from the Eurobalise to the OBE

## 3.2 Symbols

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

f	Frequency
S	Power Density
$\lambda$	Wavelength

## 3.3 Abbreviations

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

CW	Continuous Wave
FSK	Frequency Shift Keying
HS	Harmonised Standard
OBE	On-Board Equipment
RF	Radio Frequency
SRD	Short Range Device

## 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 manufacturer. The equipment shall comply with all the technical requirements of the present document which are identified as applicable in annex A at all times when operating within the boundary limits of the declared operational environmental profile.

### 4.2 Transmitter Conformance Requirements

#### 4.2.1 OBE TX Field Strength and Transmitter Mask

##### 4.2.1.1 Applicability

This test only applies to the OBE. The radiated H-field mask is defined in the direction of maximum field strength under specified conditions of measurement.

##### 4.2.1.2 Limits

The limits of figure 1 (expressed in dB $\mu$ A/m at a distance of 10 m) shall not be exceeded.

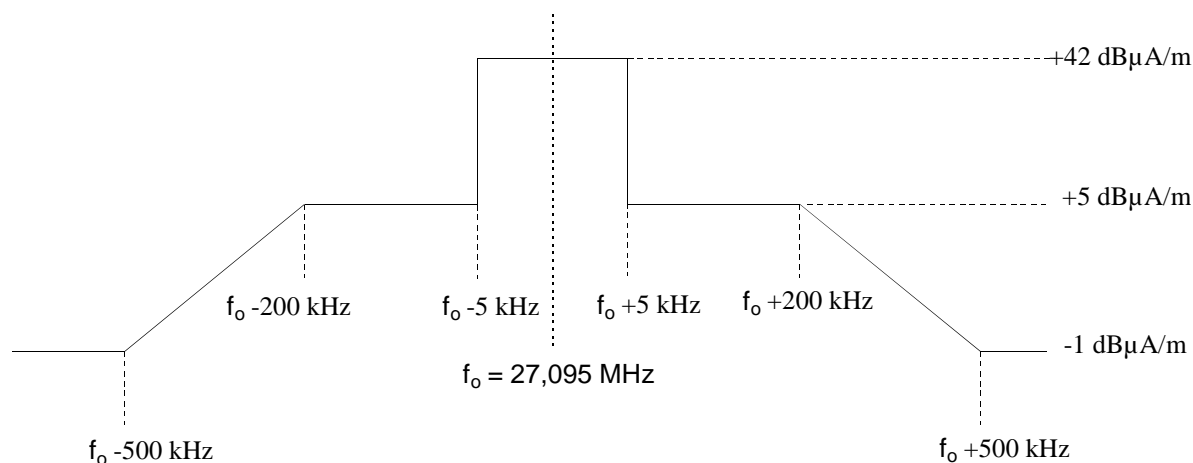


Figure 1: OBE transmitter mask

##### 4.2.1.3 Conformance

The conformance test suite for OBE transmitter mask shall be as defined in clause 6.1.1 of the present document.

##### 4.2.1.4 Maximum Allowable Measurement Uncertainty

The maximum allowable measurement uncertainty shall be as given in table 6 in clause 5.3.

### 4.2.2 OBE Unwanted Emission

##### 4.2.2.1 Applicability

This test only applies to the OBE. Unwanted emissions consist of out-of-band and spurious emissions outside the frequency range  $27,095$  MHz  $\pm$   $500$  kHz as defined in clause 4.2.1.

#### 4.2.2.2 Limits

The limits in table 2 (expressed in dB $\mu$ A/m at a distance of 10 m for frequencies below 30 MHz and expressed in dB $\mu$ V/m at a distance of 10 m for frequencies equal or greater than 30 MHz) shall not be exceeded.

**Table 2: OBE unwanted emissions limits**

Frequency: (f)	Limit
$9 \text{ kHz} \leq f < 150 \text{ kHz}$	44 dB $\mu$ A/m at 9 kHz decreasing with logarithm of frequency to 19 dB $\mu$ A/m at 150 kHz
$150 \text{ kHz} \leq f < 30 \text{ MHz}$	54 dB $\mu$ A/m at 150 kHz decreasing with logarithm of frequency to 4 dB $\mu$ A/m at 30 MHz
$30 \text{ MHz} \leq f \leq 1 \text{ GHz}$	79 dB $\mu$ V/m at 30 MHz decreasing with logarithm of frequency to 54 dB $\mu$ V/m at 1 GHz
NOTE: The values are based on the assumption that the system operates in a rail environment installed below a rail vehicle. The values are extracted from the EMC limits for rail equipment given in figure 1 (150 kHz to 1 GHz) and figure C.1 (below 150 kHz) of CENELEC EN 50121-2:2015 [i.7]. The most stringent EMC limits (Category C) decreased by 6 dB have been chosen for the limits in clause 4.2.2.2 table 2.	

#### 4.2.2.3 Conformance

The conformance test suite for OBE unwanted emission shall be as defined in clause 6.1.2 of the present document.

#### 4.2.2.4 Maximum Allowable Measurement Uncertainty

The maximum allowable measurement uncertainty shall be as given in table 6 in clause 5.3.

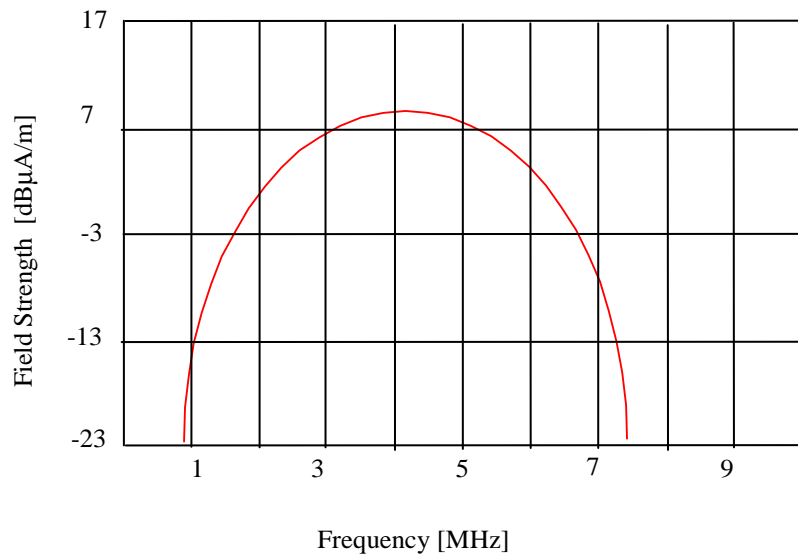
### 4.2.3 Eurobalise TX Field Strength and Transmitter Mask

#### 4.2.3.1 Applicability

This test only applies to Eurobalises. The radiated H-field uplink mask is defined in the direction of maximum field strength under specified conditions of measurement.

### 4.2.3.2 Limits

The limits of figure 2 (expressed in dB $\mu$ A/m at a distance of 10 m) shall not be exceeded.



**Figure 2: Eurobalise transmitter mask**

The defined in-band frequency range is limited to the frequency range 4,234 MHz  $\pm$  1 MHz. The maximum value in the graph of figure 2 is 9 dB $\mu$ A/m.

NOTE: ERC Recommendation 70-03 [i.2], annex 4 recommends a maximum duty cycle of 1 % for the Eurobalise transmitter. This duty cycle cannot be exceeded during normal operation it is not foreseen that a train stops above the Eurobalise, In principle, it is impossible to exceed the defined duty cycle with a moving train due to the given safety distance between trains versus Eurobalise operating range.

### 4.2.3.3 Conformance

The conformance test suite for Eurobalise transmitter mask shall be as defined in clause 6.1.3 of the present document.

### 4.2.3.4 Maximum Allowable Measurement Uncertainty

The maximum allowable measurement uncertainty shall be as given in table 6 in clause 5.3.

## 4.2.4 Eurobalise Unwanted Emission

### 4.2.4.1 Applicability

This test only applies to track site Eurobalise equipment. Unwanted emissions consist of out-of-band and spurious emissions outside the frequency range 27,095 MHz  $\pm$  500 kHz as defined in clause 4.2.1, and outside the frequency range 4,234 MHz  $\pm$  1 MHz as defined in clause 4.2.3.

### 4.2.4.2 Limits

The limits in table 3 (expressed in dB $\mu$ A/m at a distance of 10 m for frequencies below 30 MHz and expressed in dB $\mu$ V/m at a distance of 10 m for frequencies equal or greater than 30 MHz) shall not be exceeded.

**Table 3: Eurobalise unwanted emissions limits**

Frequency: (f)	Limit
$9 \text{ kHz} \leq f < 150 \text{ kHz}$	44 dB $\mu$ A/m at 9 kHz decreasing with logarithm of frequency to 19 dB $\mu$ A/m at 150 kHz
$150 \text{ kHz} \leq f < 30 \text{ MHz}$	54 dB $\mu$ A/m at 150 kHz decreasing with logarithm of frequency to 4 dB $\mu$ A/m at 30 MHz
$30 \text{ MHz} \leq f \leq 1 \text{ GHz}$	79 dB $\mu$ V/m at 30 MHz decreasing with logarithm of frequency to 54 dB $\mu$ V/m at 1 GHz
NOTE: The values are based on the assumption that the system operates in a rail environment installed below a rail vehicle. The values are extracted from the EMC limits for rail equipment given in figure 1 (150 kHz to 1 GHz) and figure C.1 (below 150 kHz) of CENELEC EN 50121-2:2015 [i.7]. The most stringent EMC limits (Category C) decreased by 6 dB have been chosen for the limits in clause 4.2.4.2 table 3.	

#### 4.2.4.3 Conformance

The conformance test suite for Eurobalise unwanted emission shall be as defined in clause 6.1.4 of the present document.

#### 4.2.4.4 Maximum Allowable Measurement Uncertainty

The maximum allowable measurement uncertainty shall be as given in table 6 in clause 5.3.

### 4.3 Receiver Conformance Requirements

#### 4.3.1 OBE Receiver Sensitivity

##### 4.3.1.1 Applicability

This only applies to the OBE receiver.

##### 4.3.1.2 Limits

The OBE receiver sensitivity limits are defined in UNISIG SUBSET-036-3.1.0 [1], clause 6.2.2.1 "Up-link Balise Detection".

##### 4.3.1.3 Conformance

The conformance test suite for OBE receiver sensitivity shall be as defined in clause 6.2.1 of the present document.

#### 4.3.2 OBE Receiver Blocking

##### 4.3.2.1 Applicability

This only applies to the OBE receiver.

##### 4.3.2.2 Limits

The normal operation of the OBE receiver shall not be blocked or disturbed by simultaneous reception of CW signals at out-band frequencies as given in table 4.

The OBE receiver blocking limits for CW shall be as given in table 4.

**Table 4: Field Strength Limits for CW**

Frequency [MHz]	Field Strength, RMS [dB $\mu$ A/m]
1,0	100
2,5	83
6,0	74

#### 4.3.2.3 Conformance

The conformance test suite for OBE receiver blocking shall be as defined in clause 6.2.2 of the present document.

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## 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 General Conditions for Testing

#### 5.2.1 Test Conditions

Testing shall be made under normal test conditions.

NOTE: The Eurobalise system components (OBE as well as the Eurobalise) are built for interoperability and the UNISIG specification [2] apply over the full operating temperature range (including the spectrum masks).

#### 5.2.2 Test Power Source

The OBE equipment shall be tested using the appropriate test power source.

The test power source used shall be stated in the test report.

The Eurobalise is purely Tele-powered during the test.

During the tests, the power source of the equipment shall be replaced by an external test power source capable of producing normal test voltages as specified in clause 5.2.4. The internal impedance of the external test power source shall be low enough for its effect on the test results to be negligible. For the purpose of the tests, the voltage of the external test power source shall be measured at the input terminals of the equipment. For radiated measurements any external power leads should be so arranged so as not to affect the measurements.

During tests, the test power source voltages shall be within a tolerance of  $< \pm 1$  % relative to the voltage at the beginning of each test. The value of this tolerance can be critical for certain measurements. Using a smaller tolerance will provide a better uncertainty value for these measurements.

## 5.2.3 Nominal Test Conditions

### 5.2.3.1 Normal Temperature and Humidity

The normal temperature and humidity conditions for tests shall be any convenient combination of temperature and humidity within the following ranges:

- Temperature +15 °C to +35 °C;
- Relative humidity 20 % to 75 %.

### 5.2.3.2 Normal Test Power Source, Mains Voltage

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages, for which the equipment was designed.

### 5.2.3.3 Normal Test Power Source, Other Power Sources

For operation from other power sources, the normal test voltage shall be that declared by the equipment manufacturer and agreed by the test laboratory. Such values shall be stated in the test report.

## 5.2.4 Requirements for Test Modulation

The OBE is un-modulated (CW) during testing. The Eurobalise is Tele-powered and the specified FSK modulation applies. The information content shall be representative of normal use.

The manufacturer shall provide the means to operate the transmitter during the tests.

## 5.2.5 Choice of Equipment

The tests shall be carried out on one or more production models or equivalent preliminary models, as appropriate. If testing is performed on (a) preliminary model(s), then the corresponding production models shall be identical to the tested models in all respects relevant for the purposes of the present document.

If equipment has several optional features that are considered to affect directly the RF parameters, then tests need only be performed on the equipment configured with the considered worst case combination of features as declared by the manufacturer.

The test shall be performed as a radiated test using the radiated measurement procedures.

The manufacturer shall provide one or more samples of the equipment, as appropriate for testing. Additionally, technical documentation and operating manuals, sufficient to make the test, shall be supplied.

## 5.2.6 Measuring Receiver

The term "measuring receiver" refers to a spectrum analyser. The bandwidth and detector type of the measuring receiver are given in table 5.

**Table 5: Measuring receiver**

Frequency: (f)	Detector type	Spectrum analyser bandwidth
$9 \text{ kHz} \leq f < 150 \text{ kHz}$	Quasi Peak	300 Hz
$150 \text{ kHz} \leq f < 27,090 \text{ MHz}$	Quasi Peak	10 kHz
$27,090 \text{ kHz} \leq f < 27,100 \text{ MHz}$	Quasi Peak	300 Hz
$27,100 \text{ kHz} \leq f < 30 \text{ MHz}$	Quasi Peak	10 kHz
$30 \text{ MHz} \leq f \leq 1 \text{ GHz}$	Quasi Peak	100 kHz

## 5.3 Interpretation of the Measurement Results

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

- the measured value related to the corresponding limit shall 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 separately included in the test report;
- the value of the measurement uncertainty should be, for each measurement, equal to or less than the figures in table 6.

**Table 6: Absolute measurement uncertainties: maximum values**

Parameter	Uncertainty
Radiated field strength	±6 dB
Temperature	±1 °C
Humidity	±10 %

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with ETSI TR 100 028 [i.3], 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 characterizing the actual measurement uncertainties are normal (Gaussian).

Table 6 is based on such expansion factors.

The particular expansion factor used for the evaluation of the measurement uncertainty shall be stated.

ETSI TR 102 273 [i.4] provides further information concerning the usage of test sites.

## 6 Performance Test Suites

### 6.1 Conformance Methods of Measurement for Transmitter

#### 6.1.1 OBE TX Field Strength and Transmitter Mask

The test conditions shall be as given in clause 5.2.

Any measured values shall be at least 6 dB above the ambient noise level.

The OBE transmitter field strength within the frequency range  $27,095 \text{ MHz} \pm 500 \text{ kHz}$  shall be determined and recorded. The OBE Tele-powering signal (it is a CW signal) is measured as follows.

The H-field is measured with a shielded loop antenna connected to a measurement receiver. The measuring bandwidth and detector type of the measurement receiver shall be in accordance with clause 5.2.6.

- The H-field strength should be measured over the frequency range  $27,095 \text{ MHz} \pm 500 \text{ kHz}$  at 10 m distance for the three polarizations of the loop antenna (x-/y-/z-axis). The maximum field strength of the three polarizations shall be recorded in the test report. Those values shall be below the limits in clause 4.2.1.2.

Where a measurement distance of 10 m is not practical, e.g. due to physical size of the equipment including the antenna or with use of special field cancelling antenna, then other distances may be used. When another distance is used, the distance used and the field strength value measured shall be stated in the test report. In this case, the measured value at actual test distance shall be extrapolated to 10 m according to annex I of ETSI EN 300 330 [i.6], and these calculations shall be stated in the test report. The H-field is measured with a shielded loop antenna connected to a measurement receiver.



## 6.1.2 OBE Unwanted Emission

The test conditions shall be as given in clause 5.2.

The measuring receiver shall be tuned over the frequency range 9 kHz to 1 GHz, excluding the frequency range 27,095 MHz  $\pm$  500 kHz on which the transmitter is intended to operate.

At each frequency at which a relevant spurious signal is detected, the OBE under test and the test antenna shall be rotated until maximum field strength is indicated on the measuring receiver. This level shall be noted.

For measuring equipment calibrated in dB $\mu$ V/m, the reading should be reduced by 51,5 dB to be converted to dB $\mu$ A/m, or vice-versa.

The OBE unwanted emissions are measured as follows.

The H-field is measured with a shielded loop antenna connected to a measurement receiver below 30 MHz. In the frequency range from 30 MHz to 300 MHz a dipole or bi-conical antenna shall be used. Above 300 MHz a log-periodic antenna shall be used. The measuring bandwidth and detector type of the measurement receiver shall be in accordance with clause 5.2.6:

- The H-field strength is measured over the frequency range 9 kHz to 30 MHz, excluding the band 27,095 MHz  $\pm$  500 kHz, at 10 m distance for the three polarizations of the loop antenna (x-/y-/z-axis). The maximum field strength of the three polarization shall be recorded in the test report. Those values shall be below the limits in clause 4.2.2.2.
- The H-field strength is measured over the frequency range 30 MHz to 1 GHz at 10 m distance for the two polarizations of the antennas (vertical and horizontal). The maximum field strength of the two polarizations shall be recorded in the test report for the frequency range 30 MHz to 1 GHz. Those values shall be below the limits in clause 4.2.2.2.

Where a measurement distance of 10 m is not practical, e.g. due to physical size of the equipment including the antenna or with use of special field cancelling antenna, then other distances may be used. When another distance is used, the distance used and the field strength value measured shall be stated in the test report. In this case, the measured value at actual test distance shall be extrapolated to 10 m according to annex I of ETSI EN 300 330 [i.6] and these calculations shall be stated in the test report.

## 6.1.3 Eurobalise Tx Field Strength and Transmitter Mask

The test conditions shall be as given in clause 5.2.

Any measured values shall be at least 6 dB above the ambient noise level.

The H-field is measured with a shielded loop antenna connected to a measurement receiver. The measuring bandwidth and detector type of the measurement receiver shall be in accordance with clause 5.2.6.

The Eurobalise transmitter field strength centred at 4,234 MHz shall be measured down to a field strength value of -23 dB $\mu$ A/m at a distance of 10 m and be recorded. During the measurement, the Eurobalise will be Tele-powered. However, a two-step approach as defined below is also allowed:

- 1) Measure and record the maximum value(s) of the transmitter spectrum at a distance of 10 m.
- 2) Perform another relative measurement at a shorter distance in order to verify the overall shape of the spectrum.

The H-field strength is measured at 10 m distance (or using the two-step approach above) for the three polarizations of the loop antenna (x-/y-/z-axis). The maximum field strength of the three polarizations shall be recorded in the test report. Those values shall be below the limits in clause 4.2.3.2.

Where a measurement distance of 10 m is not practical, e.g. due to physical size of the equipment including the antenna or with use of special field cancelling antenna, then other distances may be used. When another distance is used, the distance used and the field strength value measured shall be stated in the test report. In this case, the measured value at actual test distance shall be extrapolated to 10 m according to annex I of ETSI EN 300 330 [i.6] and these calculations shall be stated in the test report.

## 6.1.4 Eurobalise Unwanted Emission

The test conditions shall be as given in clause 5.2.

The measuring receiver shall be tuned over the frequency range 9 kHz to 1 GHz, except for the in-band frequency bands 27,095 MHz  $\pm$  500 kHz and 4,234 MHz  $\pm$  1 MHz.

The H-field is measured with a shielded loop antenna connected to a measurement receiver below 30 MHz. In the frequency range from 30 MHz to 300 MHz a dipole or bi-conical antenna shall be used. Above 300 MHz a log-periodic antenna shall be used. The measuring bandwidth and detector type of the measurement receiver shall be in accordance with clause 5.2.6.

At each frequency at which a relevant spurious signal is detected, the Eurobalise under test and the test antenna shall be rotated until maximum field strength is indicated on the measuring receiver. This level shall be noted.

For measuring equipment calibrated in dB $\mu$ V/m, the reading should be reduced by 51,5 dB to be converted to dB $\mu$ A/m, or vice-versa.

The Eurobalise unwanted emissions are measured as follows:

- The H-field strength is measured at 10 m distance over the frequency range 9 kHz to 30 MHz, excluding the bands 27,095 MHz  $\pm$  500 kHz and 4,234 MHz  $\pm$  1 MHz for the three polarizations of the loop antenna (x-/y-/z-axis). The maximum field strength of the three polarizations shall be recorded in the test report. Those values shall be below the limits in clause 4.2.4.2.
- The H-field strength is measured over the frequency range 30 MHz to 1 GHz at 10 m distance for the two polarizations of the antennas (vertical and horizontal). The maximum field strength of the two polarizations shall be recorded in the test report for the frequency range 30 MHz to 1 GHz. Those values shall be below the limits in clause 4.2.4.2.

Where a measurement distance of 10 m is not practical, e.g. due to physical size of the equipment including the antenna or with use of special field cancelling antenna, then other distances may be used. When another distance is used, the distance used and the field strength value measured shall be stated in the test report. In this case, the measured value at actual test distance shall be extrapolated to 10 m according to annex I of ETSI EN 300 330 [i.6], and these calculations shall be stated in the test report.

## 6.2 Conformance Methods of Measurement for Receiver

### 6.2.1 OBE Receiver Sensitivity

The test conditions shall be as given in clause 5.2.

The conformance test suite for the OBE receiver sensitivity is defined in UNISIG SUBSET-085-3.0.0 [2], clause 5.2.5 "Transmission Tests".

### 6.2.2 OBE Receiver Blocking

The test conditions shall be as given in clause 5.2.

The Eurobalise system shall initially operate without interference according to its specified sensitivity (operated as intended).

The fulfilment of the Eurobalise performance criterion in all possible operational modes shall be tested in the presence of the inference signals according to table 4.

For each test frequency the "reaction" of the device shall be recorded and checked against the performance criterion.

The manufacturer shall declare the performance criteria used to determine the performance of the receiving parts inside the EUT system.

A possible example of a detailed test procedure is given in UNISIG SUBSET-116-1.1.0 [i.9], clause 5.4.3.

## 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.8] 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 302 608				
Requirement			Requirement Conditionality	
No	Description	Reference: clause No	U/C	Condition
1	OBE transmitter mask	4.2.1	C	Applies only to OBE
2	OBE unwanted emissions	4.2.2	C	Applies only to OBE
3	Eurobalise transmitter mask	4.2.3	C	Applies only to Eurobalise
4	Eurobalise unwanted emissions	4.2.4	C	Applies only to Eurobalise
5	Duty cycle	4.2.3	C	Applies only to Eurobalise
6	OBE receiver sensitivity	4.3.1	C	Applies only to OBE
7	OBE receiver blocking	4.3.2	C	Applies only to OBE

### 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.

**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 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): Change history

Version	Information about changes
V1.1.1	Latest published version of ETSI EN 302 608 under R&TTE
V2.1.1	<ul style="list-style-type: none"><li>• Update of ETSI EN 302 608 in accordance with the Radio Equipment directive</li><li>• New requirement on receiver parameters for Eurobalise and OBE added</li></ul> Updated references to the relevant UNISIG standards

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## History

<b>Document history</b>		
V1.1.1	November 2008	Publication
V2.1.0	December 2016	EN Approval Procedure AP 20170315: 2016-12-15 to 2017-03-15
V2.1.1	September 2017	Vote V 20171126: 2017-09-27 to 2017-11-27