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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

Reference

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Foreword

This 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 combined Public Enquiry and 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.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

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

	Radio communications frequencies
OBE receive frequency band	2,5 MHz - 6,0 MHz
OBE transmit frequency band	27,095 MHz ± 500 kHz
Eurobalise transmit frequency band	4,234 MHz ± 1 MHz

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.

[3] 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/Documents/Set-2-Index043-SUBSET-085%20v300.pdf.

[4] CENELEC EN 50121-4:2015: "Railway applications - Electromagnetic compatibility - Part 4: Emission and immunity of the signalling and telecommunications apparatus".

[5] IEC EN 61000-4-3:2006: "Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test".

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, (OJ L153, 22.5.2014, p62).

[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 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.

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
λ	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 dBµA/m at a distance of 10 m) shall not be exceeded.

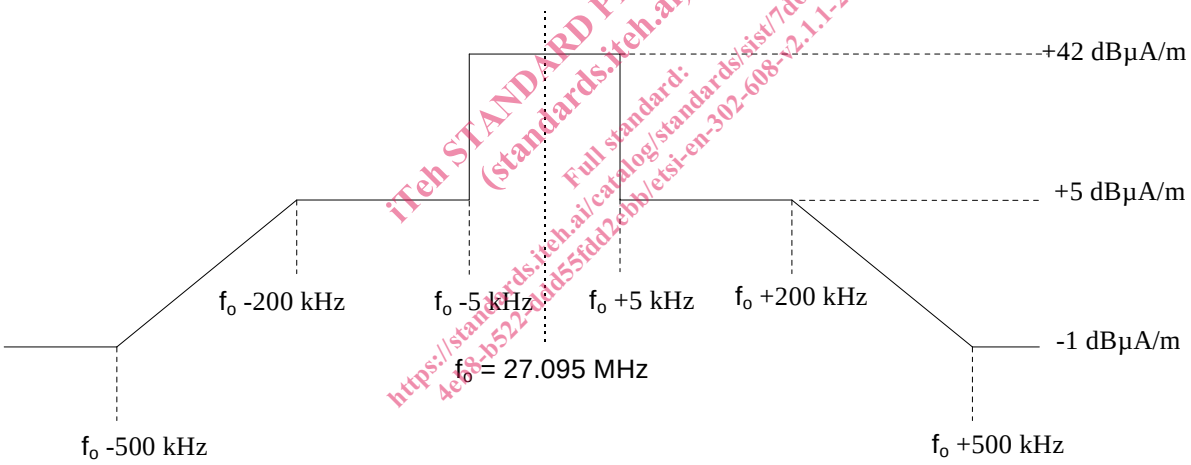

Figure 1: OBE transmitter mask

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 ± 500 kHz as defined in clause 4.2.1.3.

4.2.2.2 Limits

The limits in table 2 (expressed in dBµA/m at a distance of 10 m for frequencies below 30 MHz and expressed in dBµV/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 kHz ≤ f < 150 kHz	44 dBµA/m at 9 kHz decreasing with logarithm of frequency to 19 dBµA/m at 150 kHz
150 kHz ≤ f < 30 MHz	54 dBµA/m at 150 kHz decreasing with logarithm of frequency to 4 dBµA/m at 30 MHz
30 MHz ≤ f ≤ 1 GHz	79 dBµV/m at 30 MHz decreasing with logarithm of frequency to 54 dBµV/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.