



**Short Range Devices (SRD);
Radio equipment for Euroloop communication systems;
Harmonised Standard for access to radio spectrum**

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Contents

| | |
|--|----|
| Intellectual Property Rights | 6 |
| Foreword..... | 6 |
| Modal verbs terminology..... | 6 |
| Introduction | 7 |
| 1 Scope | 8 |
| 2 References | 8 |
| 2.1 Normative references | 8 |
| 2.2 Informative references..... | 9 |
| 3 Definition of terms, symbols and abbreviations..... | 10 |
| 3.1 Terms..... | 10 |
| 3.2 Symbols | 10 |
| 3.3 Abbreviations | 10 |
| 4 Technical requirements specifications | 11 |
| 4.1 Environmental profile..... | 11 |
| 4.2 Transmitter conformance requirements..... | 11 |
| 4.2.1 OBE TX field strength and Transmitter mask | 11 |
| 4.2.1.1 Applicability..... | 11 |
| 4.2.1.2 Limits | 11 |
| 4.2.1.3 Conformance | 11 |
| 4.2.2 OBE unwanted emissions | 12 |
| 4.2.2.1 Applicability..... | 12 |
| 4.2.2.2 Limits | 12 |
| 4.2.2.3 Conformance | 12 |
| 4.2.3 Trackside Equipment transmitter field strength | 12 |
| 4.2.3.1 Applicability..... | 12 |
| 4.2.3.2 Limits | 12 |
| 4.2.3.3 Conformance | 12 |
| 4.2.4 Trackside Equipment transmitter mask..... | 12 |
| 4.2.4.1 Applicability..... | 12 |
| 4.2.4.2 Limit..... | 13 |
| 4.2.4.3 Conformance | 13 |
| 4.3 Receiver Conformance requirements | 13 |
| 4.3.1 OBE Receiver sensitivity | 13 |
| 4.3.1.1 Applicability..... | 13 |
| 4.3.1.2 Limits | 13 |
| 4.3.1.3 Conformance | 13 |
| 4.3.2 OBE Receiver error behaviour at high wanted input signal level..... | 13 |
| 4.3.2.1 Applicability..... | 13 |
| 4.3.2.2 Limits | 14 |
| 4.3.2.3 Conformance | 14 |
| 4.3.3 OBE Receiver distortion immunity | 14 |
| 4.3.3.1 Applicability..... | 14 |
| 4.3.3.2 Limits | 14 |
| 4.3.3.3 Conformance | 14 |
| 4.3.4 OBE Receiver inter-modulation immunity | 14 |
| 4.3.4.1 Applicability..... | 14 |
| 4.3.4.2 Limits | 14 |
| 4.3.4.3 Conformance | 14 |
| 4.3.5 OBE Receiver co-channel rejection..... | 14 |
| 4.3.5.1 Applicability..... | 14 |
| 4.3.5.2 Limits | 14 |
| 4.3.5.3 Conformance | 14 |
| 4.3.6 OBE Receiver blocking | 14 |
| 4.3.6.1 Applicability..... | 14 |

| | | |
|-----------|--|----|
| 4.3.6.2 | Limits | 15 |
| 4.3.6.3 | Conformance | 15 |
| 4.3.7 | OBE Receiver dynamic receiver performance | 15 |
| 4.3.7.1 | Applicability..... | 15 |
| 4.3.7.2 | Limits | 15 |
| 4.3.7.3 | Conformance..... | 15 |
| 4.3.8 | OBE Receiver multipath dynamic performance | 15 |
| 4.3.8.1 | Applicability..... | 15 |
| 4.3.8.2 | Limits | 15 |
| 4.3.8.3 | Conformance..... | 15 |
| 4.3.9 | OBE Receiver tolerable centre frequency error | 15 |
| 4.3.9.1 | Applicability..... | 15 |
| 4.3.9.2 | Limits | 15 |
| 4.3.9.3 | Conformance..... | 15 |
| 4.3.10 | OBE Receiver tolerable chip rate error..... | 16 |
| 4.3.10.1 | Applicability..... | 16 |
| 4.3.10.2 | Limits | 16 |
| 4.3.10.3 | Conformance..... | 16 |
| 4.3.11 | OBE Receiver tolerable MTIE of the chip rate..... | 16 |
| 4.3.11.1 | Applicability..... | 16 |
| 4.3.11.2 | Limits | 16 |
| 4.3.11.3 | Conformance..... | 16 |
| 4.3.12 | Trackside Equipment Receiver sensitivity | 16 |
| 4.3.12.1 | Applicability..... | 16 |
| 4.3.12.2 | Limits | 16 |
| 4.3.12.3 | Conformance..... | 16 |
| 5 | Testing for compliance with technical requirements..... | 16 |
| 5.1 | Environmental conditions for testing | 16 |
| 5.2 | General conditions for testing | 17 |
| 5.2.1 | Test conditions..... | 17 |
| 5.2.2 | Test power source | 17 |
| 5.2.3 | Normal test conditions..... | 17 |
| 5.2.3.1 | Normal temperature and humidity | 17 |
| 5.2.3.2 | Normal test power source..... | 17 |
| 5.2.3.2.1 | Mains voltage | 17 |
| 5.2.3.2.2 | Other power sources | 17 |
| 5.2.4 | Extreme test conditions | 17 |
| 5.2.5 | Choice of equipment for test suites..... | 18 |
| 5.2.5.1 | Choice of model | 18 |
| 5.2.5.2 | Measuring receiver..... | 18 |
| 5.3 | Void..... | 18 |
| 6 | Performance Test Suites | 18 |
| 6.1 | Conformance methods of measurement for transmitters..... | 18 |
| 6.1.1 | OBE Tx field strength and Transmitter Mask..... | 18 |
| 6.1.2 | OBE Unwanted Emission | 19 |
| 6.1.3 | Trackside Equipment field strength measurements | 19 |
| 6.1.4 | Trackside Equipment transmitter conducted measurements | 20 |
| 6.2 | Conformance Methods of Measurement for Receiver..... | 20 |
| 6.2.1 | OBE receiver sensitivity | 20 |
| 6.2.2 | OBE receiver error behaviour at high wanted input signal level | 20 |
| 6.2.3 | OBE receiver distortion immunity | 20 |
| 6.2.4 | OBE receiver inter-modulation immunity | 20 |
| 6.2.5 | OBE Receiver co-channel rejection | 20 |
| 6.2.6 | OBE Receiver blocking | 21 |
| 6.2.7 | OBE receiver dynamic receiver performance | 21 |
| 6.2.8 | OBE receiver multipath dynamic performance..... | 21 |
| 6.2.9 | OBE receiver tolerable centre frequency error | 21 |
| 6.2.10 | OBE Receiver tolerable chip rate error..... | 21 |
| 6.2.11 | OBE Receiver tolerable MTIE of the chip rate..... | 21 |
| 6.2.12 | Trackside Equipment receiver sensitivity | 21 |

| | | |
|-------------------------------|---|-----------|
| Annex A (informative): | Relationship between the present document and the essential requirements of Directive 2014/53/EU | 22 |
| Annex B (normative): | Field strength measurements along the Euroloop | 24 |
| Annex C (normative): | Radiated measurements | 25 |
| C.1 | Test sites and general arrangements for measurements involving the use of radiated fields | 25 |
| C.1.0 | General | 25 |
| C.1.1 | Anechoic chamber | 25 |
| C.1.2 | Anechoic chamber with a conductive ground plane | 26 |
| C.1.3 | Open Area Test Site (OATS) | 28 |
| C.1.3.0 | General | 28 |
| C.1.3.1 | Measurements below 30 MHz | 28 |
| C.1.3.2 | Measurements above 30 MHz | 28 |
| Annex D (normative): | H-field measurements and limits at 3 m and 30 m | 30 |
| D.0 | General | 30 |
| D.1 | Limits for measurements at 30 m distance | 30 |
| D.2 | Limits for measurements at 3 m distance | 31 |
| Annex E (informative): | Maximum measurement uncertainty | 33 |
| Annex F (informative): | Selection of receiver parameters..... | 34 |
| F.1 | OBE Receiver parameters as listed in ETSI EG 203 336 V1.1.1 | 34 |
| F.1.1 | Receiver sensitivity | 34 |
| F.1.2 | Adjacent channel selectivity | 34 |
| F.1.3 | Blocking | 34 |
| F.1.4 | Co-channel rejection | 34 |
| F.1.5 | Spurious response rejection | 35 |
| F.1.6 | Inter-modulation | 35 |
| F.1.7 | Dynamic range | 35 |
| F.1.8 | Reciprocal mixing | 35 |
| F.1.9 | Desensitization | 35 |
| F.1.10 | Signal interference handling | 35 |
| F.2 | Other receiver parameters | 36 |
| F.2.1 | Receiver Multipath dynamic performance | 36 |
| F.2.2 | Receiver tolerable centre frequency | 36 |
| F.2.3 | Receiver tolerable chip rate error | 36 |
| F.2.4 | Receiver tolerable MTIE | 36 |
| F.2.5 | Receiver error behaviour at high wanted input signal | 36 |
| F.2.6 | Receiver distortion immunity | 36 |
| Annex G (informative): | Change History | 37 |
| History | 38 | |

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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.7] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.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.

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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 Euroloop communication system is defined by the specifications [1] and [2] of the UNISIG consortia.

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1 Scope

The present document specifies technical characteristics and methods of measurements for radio transmitters and receivers used in the Euroloop communications system. The system is used in railway systems.

The present document applies to the following equipment:

- 1) The On-Board Equipment (OBE) transmitting the tele-powering to wake-up the Trackside Equipment and receiving the Euroloop signal. The OBE comprises a receiver fitted with a dedicated antenna.
- 2) The Trackside Equipment receiving the tele-powering and transmitting the Euroloop signal. The antenna is a leaky feeder cable that is always installed in an inner or outer foot of a rail.

NOTE 1: For the purposes of the present document term "Euroloop" will be used as a descriptive term of the Euroloop communication system as defined by the specifications [1] and [2] of the UNISIG consortia.

The Euroloop transmission system operates in frequency bands listed in table 1 in accordance with the EC Decision 2013/752/EU [i.2], and ERC Recommendation 70-03 [i.3], annex 4.

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

Table 1: Radio communications frequencies

| Radio communications frequencies | |
|---|--|
| OBE receive frequency band | 11,1 MHz - 16,0 MHz |
| OBE transmit frequency band | 27,09 MHz - 27,10 MHz |
| OBE transmit modulation | un-modulated RF carrier, continuous wave |
| Trackside Equipment receiver frequency band | 27,09 MHz - 27,10 MHz |
| Trackside Equipment transmit frequency band | 11,1 MHz - 16,0 MHz |
| Trackside Equipment transmit modulation | BPSK, DSSS chip rate 4,516 MHz |

NOTE 2: The relationship between the present document and essential requirements of article 3.2 of Directive 2014/53/EU [i.1] is given in annex A

The present document contains requirements to demonstrate that radio equipment both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference.

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.

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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] ERTMS/ETCS: "FFFIS for Euroloop", SUBSET-044, Issue 2.4.0, 29th February 2012.

NOTE: Available at https://www.era.europa.eu/content/set-specifications-2-etcs-b3-mr1-gsm-r-b1_en.

[2] ERTMS/ETCS: "Test Specification for Euroloop", SUBSET-103, Issue 1.1.0, 29th February 2012.

NOTE: Available at https://www.era.europa.eu/content/set-specifications-2-etcs-b3-mr1-gsm-r-b1_en.

[3] CISPR 16-1-4:2019: "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-4: Radio disturbance and immunity measuring apparatus - Antennas and test sites for radiated disturbance measurements".

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, p.62).
- [i.2] 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.3] CEPT/ERC/Recommendation 70-03: "Relating to the use of Short Range Devices (SRD)".
- [i.4] ETSI TR 100 028-1 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1".
- [i.5] ETSI TR 100 028-2 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".
- [i.6] EN 50121-2 (2015-03): "Railway applications - Electromagnetic compatibility - Part 2: Emission of the whole railway system to the outside world" / Applies in conjunction with EN 50121-1 (2000-09)" (produced by CENELEC).
- [i.7] Commission Implementing Decision C(2015) 5376 final of 4.8.2015 on a standardisation request to the European Committee for Electrotechnical Standardisation and to the European Telecommunications Standards Institute as regards radio equipment in support of Directive 2014/53/EU of the European Parliament and of the Council.
- [i.8] ETSI TR 102 273-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 2: Anechoic chamber".
- [i.9] ETSI TR 102 273-3: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 3: Anechoic chamber with a ground plane".
- [i.10] ETSI TR 102 273-4: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 4: Open area test site".
- [i.11] ETSI EG 203 336 (V1.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Guide for the selection of technical parameters for the production of Harmonised Standards covering article 3.1(b) and article 3.2 of Directive 2014/53/EU".

3 Definition of terms, symbols and abbreviations

3.1 Terms

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

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

Eurobalise: trackside 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.

Euroloop: trackside transmission unit that uses the magnetic transmission technology

NOTE: Its main function is to transmit signals through the air gap. The Euroloop is a single device (leaky feeder cable) mounted on the track, which communicates with a train passing over it.

magnetic transmission technology: method that uses magnetic coupling in the air gap between a transmitter and a receiver

NOTE: In the Euroloop transmission system context, it considers systems using the band 11,1 - 16,0 MHz for Uplink (track to train) transmission.

RF carrier: fixed radio frequency prior to modulation

tele-powering: signal transmitted by the OBE, which activates the Trackside Equipment

uplink: transmission link from the Trackside Equipment to the OBE

3.2 Symbols

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

| | |
|-----------|------------|
| f | Frequency |
| Ω | Ohm |
| R | Distance |
| R_C | Chip rate |
| λ | wavelength |

3.3 Abbreviations

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

| | |
|------|---------------------------|
| BER | Bit Error Ratio |
| BPSK | Binary Phase Shift Keying |
| CW | Continuous Wave |
| dB | deciBel |

NOTE: Logarithmic scale.

| | |
|-------|--|
| DSSS | Direct Sequence Spread Spectrum |
| EMC | ElectroMagnetic Compatibility |
| ERC | European Radiocommunications Committee |
| EUT | Equipment Under Test |
| LOOMO | LOOp MOdem |
| MTIE | Maximum Time Interval Error |
| OATS | Open Area Test Site |
| OBE | On-Board Equipment |

| | |
|--------|---|
| R&TTE | Radio and Telecommunications Terminal Equipment |
| RF | Radio Frequency |
| RMS | Root Mean Square |
| SRD | Short Range Device |
| TX | Transmitter |
| UNISIG | UNion Industry of SIGnalling |
| VSWR | Voltage Standing Wave Ratio |

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 in accordance with its intended use. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the operational environmental profile defined by its intended use.

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.

NOTE: Eurobalise-OBE tele-powering is used for wake-up of the Trackside Equipment.

4.2.1.2 Limits

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

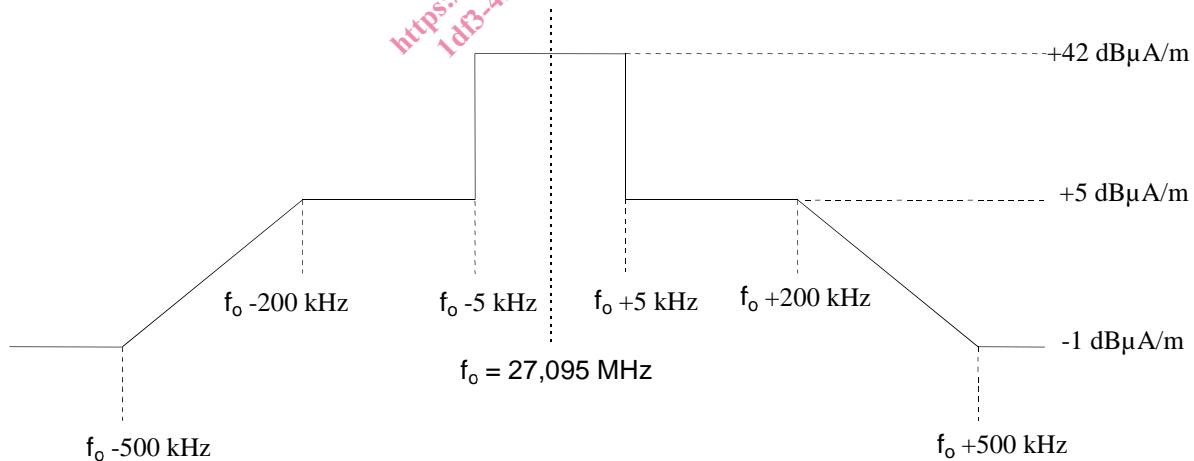


Figure 1: OBE transmitter mask

The maximum OBE TX field strength of +42 dB μ A/m at 10 m distance is in accordance with the EC Decision for SRDs [i.2] and ERC Recommendation 70-03 [i.3], annex 4.

4.2.1.3 Conformance

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