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Harmonized European Standard (Telecommunications series)

Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment for Euroloop railway systems; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive

Reference

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Contents

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Foreword

This Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the Public Enquiry phase of the ETSI standards Two-step Approval Procedure.

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity ("the R&TTE Directive").

Technical specifications relevant to Directive 1999/5/EC are given in annex A.

The Euroloop transmission system operates in accordance with ERC Recommendation 70-03, annex 4.

These specifications are complementary with the system and interoperability requirements for these devices established under Commission Decision 2004/447/EC.

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

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 R&TTE Directive. The modular structure is shown in EG 201 399 [4].

The Euroloop communication system is defined by the specifications of the UNISIG consortia [5].

1 Scope

The present document covers the technical requirements for radio transmitters and receivers used in the Euroloop transmission system. The system is only used in railway systems.

It applies to the following two equipment units:

- The OnBoard Equipment (OBE) receiving the Euroloop signal and the OBE comprises a receiver fitted with a dedicated antenna.
- The TrackSide Equipment (Euroloop) transmitting the Euroloop signal that is always installed in an inner or outer foot of a rail.

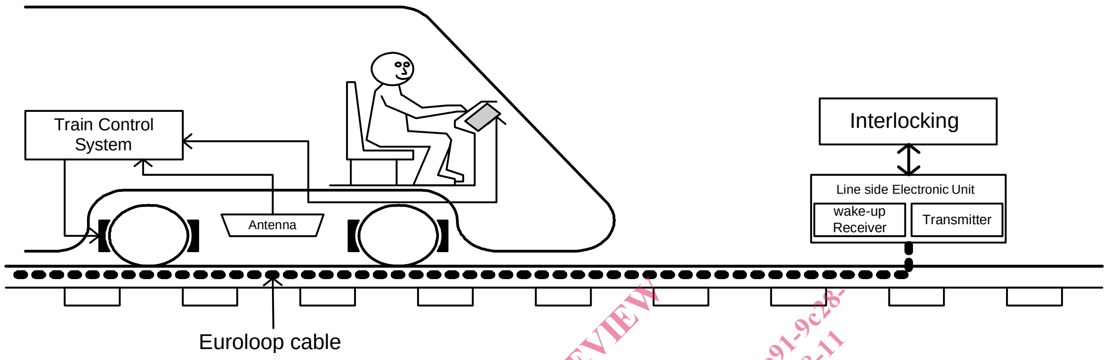

Figure 1: Euroloop situation on railway track

The Euroloop comprises DSSS-BPSK-modulated transmitter fitted with a dedicated antenna. It is always switched on but is only transmitting in the presence of a train.

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

Table 1: Radiocommunications service frequency bands

	Radiocommunications service frequency bands
OBE receive centre frequency	13,547 MHz
Euroloop receiver centre frequency	27,095 MHz
Euroloop transmit centre frequency	13,547 MHz
Euroloop transmit modulation	BPSK, DSSS chip rate 4,516 MHz

The present document is intended to cover the provisions of Directive 1999/5/EC (R&TTE Directive) article 3.2, which states that "… radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communications and orbital resources so as to avoid harmful interference".

NOTE: A list of such ENs is included on the web site http://www.newapproach.org.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
  - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
  - for informative references.

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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.

2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] ETSI TR 100 028 (2001-12) (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

[2] ERTMS/ETCS - CLASS 1, SUBSET-044 FFFIS for Euroloop.

2.2 Informative references

[3] ETSI TR 102 273 (2001-12) (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM): Improvement of radiated methods of measurement (using test sites) and evaluation of the corresponding measurement uncertainties".

[4] ETSI EG 201 399 (V2.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of candidate Harmonized Standards for application under the R&TTE Directive".

[5] The UNISIG Consortium was composed of the following European Companies working in the Railway Signalling area: Alstom, Ansaldo Signal, Bombardier, Invesys Rail, Siemens, and Thales.

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

euroloop: wayside 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 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 13,547 MHz for Uplink (track to train) transmission.

rf carrier: a fixed radio frequency prior to modulation

uplink: transmission link from the Euroloop to the OBE

3.2 Symbols

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

f	Frequency
f_H	Highest frequency of the power envelope
f_L	Lowest frequency of the power envelope
Ω	ohm
R	Distance
λ	wavelength

3.3 Abbreviations

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

BPSK	Binary Phase Shift Keying
dB	Decibel
DSSS	Direct Sequence Spread Spectrum
OBE	On-Board Equipment
R&TTE	Radio and Telecommunications Terminal Equipment
RBW	Resolution BandWidth
RF	Radio Frequency
RMS	Root mean square
SRD	Short Range Device

4 Technical requirements specification

4.1 OBE unwanted emissions

4.1.1 Definition

This test only applies to the OBE.

NOTE: Eurobalise-OBU tele-powering is used for wake-up the Euroloop.

4.1.2 Test procedure

This test is performed using a radiated measurement for frequencies below 30 MHz and a conducted measurement for frequencies from 3 MHz to 1 000 MHz (see clause 7.1 OBE unwanted emissions).

4.1.3 Limit

The spurious components between 9 kHz and 10 MHz shall not exceed a generated H-field at a distance of 10 m of 5,5 dBµA/m at 9 kHz descending 3 dB/oct. and -22 dBµA/m between 10 MHz and 30 MHz measured in 10 kHz bandwidth.

The spurious components above 30 MHz shall not exceed the conducted power of 2 nW into 50 Ω resistive load.

4.2 Euroloop field strength

4.2.1 Definition

This test only applies to Euroloop transmitter.

4.2.2 Test procedure

This test is performed using a radiated measurement (see clause 7.3 Euroloop field strength measurements).

4.2.3 Limit

The transmitted magnetic field strength shall not exceed -7 dBµA/m at 10 m distance within the frequency range of 11,1 MHz to 16,0 MHz measured in a bandwidth of 10 kHz spatially averaged over any 200 m length of the loop.

4.3 Euroloop transmitter mask

4.3.1 Definition

This test only applies to Euroloop transmitters.

4.3.2 Test procedure

This test is performed using conducted measurement (see clause 7.2 Euroloop transmitter conducted measurements).

4.3.3 Limit

The measured spectrum (field strength) shall not exceed the relative frequency mask values of figure 2.

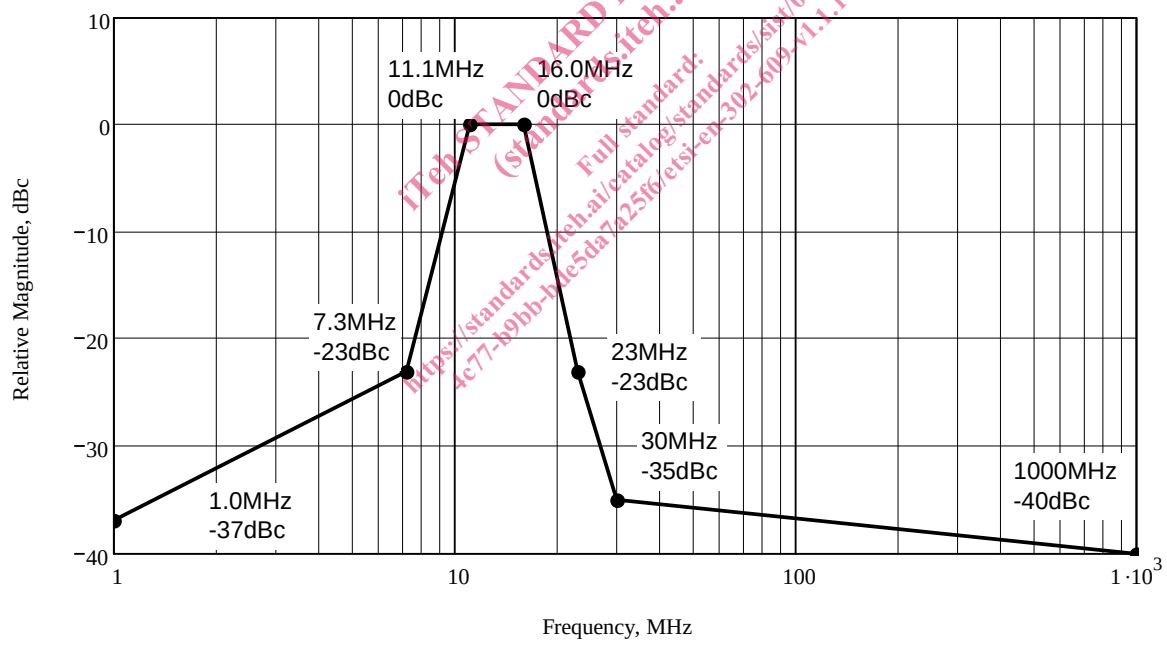

Figure 2: Euroloop transmitter spectrum and spurious mask

The limit at 1 MHz shall also apply for frequencies below 1 MHz.

4.4 Maximum allowable measurement uncertainty

See clause 6 Measurement uncertainty, table 3.

5 Test conditions

5.1 Test conditions

Testing shall be made under normal test conditions.

NOTE: The Euroloop system components (OBE as well as the Euroloop) are built for interoperability and the UNISIG specifications apply over the full operating temperature range (including the spectrum masks).

The test conditions and procedures shall be as specified in clauses 5.2 Test power source to 5.6Measuring receiver.

5.2 Test power source

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

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

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 clauses 5.3.2. 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 < ±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.

5.3 Normal test conditions

5.3.1 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 %.

5.3.2 Normal test power source

5.3.2.1 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.

The frequency of the test power source corresponding to the ac mains shall be between 49 Hz and 51 Hz.

5.3.2.2 Other power sources

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