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**Elektromagnetna združljivost in zadeve v zvezi z radijskim spektrom (ERM) -  
Naprave kratkega dosega (SRD) - Radijska oprema v frekvenčnem območju od 9  
kHz do 25 MHz in sistemi z indukcijsko zanko v frekvenčnem območju od 9 kHz do  
30 MHz - 1. del: Tehnične karakteristike in preskusne metode**

Electromagnetic compatibility and Radio spectrum Matters (ERM) - 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 - Part 1: Technical characteristics and  
test methods

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# ETSI EN 300 330-1 V1.8.1 (2015-03)



**Electromagnetic compatibility  
and Radio spectrum Matters (ERM);  
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;  
Part 1: Technical characteristics and test methods**

## Reference

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# Contents

Intellectual Property Rights .....	7
Foreword.....	7
Modal verbs terminology.....	7
Introduction .....	8
1 Scope .....	9
2 References .....	10
2.1 Normative references .....	10
2.2 Informative references.....	11
3 Definitions, symbols and abbreviations .....	12
3.1 Definitions .....	12
3.2 Symbols.....	13
3.3 Abbreviations .....	14
4 Technical requirements specifications .....	15
4.1 General requirements .....	15
4.1.1 Receiver categorization.....	15
4.1.2 General performance criteria .....	15
4.1.3 General performance criteria for wireless power transfer (WPT) systems .....	15
4.2 Presentation of equipment for testing purposes.....	17
4.2.1 Choice of model for testing .....	17
4.2.2 Testing of equipment with alternative radiated H-field strengths .....	18
4.2.3 Testing of equipment that does not have an external 50 $\Omega$ RF connector (integral antenna equipment) .....	18
4.2.3.1 Equipment with an internal permanent or temporary antenna connector.....	18
4.2.3.2 Equipment with a temporary antenna connector.....	18
4.2.3.3 Wireless Power Transfer systems .....	18
4.2.4 On-site testing.....	18
4.3 Mechanical and electrical design.....	18
4.3.1 General.....	18
4.3.1.1 WPT .....	18
4.3.2 Controls .....	18
4.3.3 Transmitter shut-off facility.....	19
4.3.4 Receiver mute or squelch.....	19
4.3.5 Marking (equipment identification).....	19
4.3.5.1 Equipment identification .....	19
4.3.5.2 Equipment marking .....	19
4.4 Declarations by the provider .....	19
4.5 Auxiliary test equipment .....	19
4.6 Interpretation of the measurement results .....	19
5 Test conditions, power sources and ambient temperatures .....	20
5.1 Normal and extreme test conditions .....	20
5.2 Test power source.....	20
5.2.1 External test power source .....	20
5.2.2 Internal test power source .....	20
5.3 Normal test conditions.....	20
5.3.1 Normal temperature and humidity .....	20
5.3.2 Normal test power source .....	21
5.3.2.1 Mains voltage .....	21
5.3.2.2 Regulated lead-acid battery power sources .....	21
5.3.2.3 Other power sources.....	21
5.4 Extreme test conditions .....	21
5.4.1 Extreme temperatures .....	21
5.4.1.1 Procedure for tests at extreme temperatures.....	21
5.4.1.1.1 Procedure for equipment designed for continuous operation .....	21
5.4.1.1.2 Procedure for equipment designed for intermittent operation .....	21

5.4.1.2	Extreme temperature ranges.....	22
5.4.2	Extreme test source voltages.....	22
5.4.2.1	Mains voltage.....	22
5.4.2.2	Regulated lead-acid battery power sources.....	22
5.4.2.3	Power sources using other types of batteries.....	22
5.4.2.4	Other power sources.....	23
6	General conditions.....	23
6.1	Normal test signals and test modulation.....	23
6.1.1	Normal test signals for analogue speech.....	23
6.1.2	Normal test signals for data.....	23
6.2	Artificial antenna.....	23
6.2.1	Artificial antenna for inductive transmitters (non 50 $\Omega$ ).....	23
6.2.2	Artificial antenna for transmitters with 50 $\Omega$ impedance connector.....	24
6.3	Test fixture.....	24
6.4	Test sites and general arrangements for radiated measurements.....	25
6.5	Modes of operation of the transmitter.....	25
6.6	Measuring receiver.....	25
7	Transmitter requirements.....	25
7.1	Transmitter definitions.....	26
7.1.1	The inductive loop coil transmitters.....	26
7.1.2	The large size loop transmitters.....	26
7.1.3	Other transmitters.....	26
7.1.4	Product Classes.....	26
7.2	Transmitter carrier output levels.....	30
7.2.1	H-field (radiated).....	30
7.2.1.1	Definition.....	30
7.2.1.2	Methods of measurement.....	30
7.2.1.3	Limits.....	30
7.2.2	RF carrier current (Product Class 3 only).....	32
7.2.2.1	Definition.....	32
7.2.2.2	Methods of measurement.....	32
7.2.2.3	Limits.....	32
7.2.3	Radiated E-field (Product Class 4 only).....	32
7.2.3.1	Definition.....	32
7.2.3.2	Methods of measurement.....	32
7.2.3.3	Limits.....	33
7.3	Permitted range of operating frequencies.....	33
7.3.1	Definition.....	33
7.3.2	Method of measurement.....	33
7.3.3	Limits.....	33
7.4	Permitted frequency range of the modulation bandwidth.....	33
7.4.1	Definition.....	34
7.4.2	Method of measurement.....	34
7.4.3	Limits.....	34
7.5	Spurious domain emission limits.....	35
7.5.1	Definition.....	35
7.5.2	Conducted spurious emissions (Product class 3 only).....	35
7.5.2.1	Methods of measurement (< 30 MHz).....	35
7.5.2.2	Limits.....	35
7.5.2.3	Methods of measurement ( $\geq$ 30 MHz).....	35
7.5.2.4	Limits.....	36
7.5.3	Radiated field strength.....	36
7.5.3.1	Methods of measurement (< 30 MHz).....	36
7.5.3.2	Limits.....	36
7.5.4	Effective radiated power.....	36
7.5.4.1	Methods of measurement ( $\geq$ 30 MHz).....	37
7.5.4.2	Limits.....	37
8	Receiver requirement.....	38
8.1	Adjacent channel selectivity - in band.....	38
8.1.1	Definition.....	38

8.1.2	Method of measurement .....	38
8.1.3	Limits.....	39
8.2	Blocking or desensitization (Receiver category 1 and 2 only) .....	39
8.2.1	Definition.....	39
8.2.2	Methods of measurement.....	39
8.2.3	Limits.....	40
8.3	Receiver spurious radiation .....	40
8.3.1	Definition.....	41
8.3.2	Methods of measurement.....	41
8.3.3	Limits.....	41
8.3.3.1	Radiated emissions below 30 MHz.....	41
8.3.3.2	Radiated emissions above 30 MHz .....	41
9	Measurement uncertainty .....	41
10	Interpretation of results .....	42
10.1	Measurement uncertainty is equal to or less than maximum acceptable uncertainty .....	42
<b>Annex A (normative): Radiated measurement.....</b>		<b>43</b>
A.1	Test sites and general arrangements for measurements involving the use of radiated fields .....	43
A.1.1	Anechoic chamber.....	43
A.1.2	Anechoic chamber with a conductive ground plane.....	44
A.1.3	Open Area Test Site (OATS) .....	45
A.1.3.1	Measurements below 30 MHz .....	46
A.1.3.2	Measurements above 30 MHz .....	46
A.1.4	Test antenna.....	47
A.1.5	Substitution antenna.....	48
A.1.6	Measuring antenna.....	48
A.2	Guidance on the use of radiation test sites.....	48
A.2.1	Verification of the test site .....	48
A.2.2	Preparation of the EUT.....	48
A.2.3	Power supplies to the EUT.....	48
A.2.4	Range length.....	49
A.2.4.1	Far-field length above 30 MHz.....	49
A.2.4.2	Near-field and Far-field length below 30 MHz.....	49
A.2.5	Site preparation .....	50
A.3	Coupling of signals.....	50
A.3.1	General .....	50
A.3.2	Data signals .....	50
A.4	Standard test position .....	50
A.5	Test fixture .....	51
A.5.1	Description .....	51
A.5.2	Calibration.....	52
A.5.3	Mode of use.....	52
A.6	Technical performance of the spectrum analyser.....	53
<b>Annex B (normative): H-field limit correction factor for generated E-fields.....</b>		<b>54</b>
<b>Annex C (normative): Customized loop antennas.....</b>		<b>55</b>
C.1	Product classes related to the antenna loop .....	55
C.1.1	Antenna loops below 1 MHz.....	55
C.1.2	Antenna loops above 1 MHz .....	56
<b>Annex D (informative): Test fixture for measuring inductive transmitter carrier and harmonic currents by use of an artificial antenna (Product Class 3 only).....</b>		<b>58</b>
<b>Annex E (informative): E-fields in the near field at low frequencies.....</b>		<b>60</b>

<b>Annex F (normative):</b>	<b>H-field measurements and limits at 3 m and 30 m .....</b>	<b>61</b>
F.1	Limits for measurements at 30 m distance .....	61
F.2	Limits for measurements at 3 m distance .....	62
<b>Annex G (normative):</b>	<b>Transmitter emission levels and spectrum mask measurements.....</b>	<b>63</b>
<b>Annex H (normative):</b>	<b>Generic inductive loop limits in the frequency range 148,5 kHz to 30 MHz .....</b>	<b>66</b>
H.1	Introduction .....	66
H.2	Radiated H-field strength .....	66
H.2.1	Methods of measurements .....	66
H.2.2	Radiated H-field strength limit .....	66
H.2.2.1	Radiated total H-field and H-field density limits according to the measurements in clause H.2.1 indent a) .....	66
H.2.2.2	Radiated bandwidth and H-field density limits according to the measurements in clause H.2.1 indent b) .....	67
H.3	Other requirements .....	67
<b>Annex I (informative):</b>	<b>Determination and use of the measurement bandwidth.....</b>	<b>68</b>
<b>Annex J (informative):</b>	<b>Other limits.....</b>	<b>69</b>
<b>Annex K (informative):</b>	<b>Bibliography.....</b>	<b>70</b>
History .....		71

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## Foreword

This European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document includes improvements to the previous version of the standard that take advantage of technical developments within the SRD industry.

The present document is part 1 of a multi-part deliverable covering Electromagnetic compatibility and Radio spectrum Matters (ERM); 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, as identified below:

**Part 1: "Technical characteristics and test methods";**

Part 2: "Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".

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National transposition dates	
Date of adoption of this EN:	20 February 2015
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## Modal verbs terminology

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## Introduction

The present document has been prepared to:

- Enhance operating conditions for RFIDs in the 13,56 MHz Band with regard to high datarate wideband low level systems up to  $\pm 7$  MHz for ISO 14443 [i.9] type applications including NFC and secondly for higher operating range, narrowband high level modulation for ISO 15693 [i.10] and ISO 18000-3 [i.11] type systems.
- Include wireless inductive power transfer (WPT) systems.

# 1 Scope

The present document applies to the following Short Range Device major equipment types:

- 1) Generic Short range Devices including transmitters operating in the range from 9 kHz to 25 MHz; and
- 2) inductive loop transmitters operating from 9 kHz to 30 MHz including Radio Frequency Identification (RFID) and EAS operating in LF and HF ranges and for radio equipment including wireless power transfer (WPT) function in the same frequency range;
- 3) receivers of systems as defined by bullets 1 and 2.

These radio equipment types are capable of operating in the permitted frequency bands within the 9 kHz to 30 MHz range as specified in table 1:

- either with a Radio Frequency (RF) output connection and dedicated antenna or with an integral antenna;
- for all types of modulation;
- receivers of systems as defined by bullets 1 and 2.

Table 1 shows a list of the frequency bands as designated to Short Range Devices and the CEPT/ERC/REC 70-03 [i.1] as known at the date of publication of the present document.

When selecting parameters for new SRDs, which may have inherent safety of human life implications, manufacturers and users should pay particular attention to the potential for interference from other systems operating in the same or adjacent bands.

The present document covers fixed stations, mobile stations and portable stations. If a system includes transponders, these are measured together with the transmitter.

All types of modulation for radio devices are covered by the present document, provided the requirements of clause 7.3 are met.

The radio equipment, covered by the classification SRD is divided into several classes based on the maximum radiated magnetic field strength. The field strength designation in the present document is based on CEPT/ERC/REC 70-03 [i.1] and National SRD-frequency designations.

Three types of measuring methods are defined in the present document due to the varied nature of the antenna types for equipment used in this band. One method measures the RF carrier current, another measures the radiated H-field and the third conducted power.

The present document covers requirements for radiated emissions below as well as above 30 MHz.

Additional standards or specifications may be required for equipment such as that intended for connection to the Public Switched Telephone Network (PSTN).

**Table 1: Short Range Devices within the 9 kHz to 30 MHz permitted frequency bands**

	Frequency Bands/frequencies	Applications
Transmit and Receive	9 kHz to 90 kHz	Inductive devices, Generic use
Transmit and Receive	90 kHz to 119 kHz	Inductive devices, Generic use
Transmit and Receive	119 kHz to 140 kHz	Inductive devices, Generic use
Transmit and Receive	140 kHz to 148,5 kHz	Inductive devices, Generic use
Transmit and Receive	148,5 kHz to 5 MHz	Inductive devices, Generic use
Transmit and Receive	400 kHz to 600 kHz	RFID only
Transmit and Receive	5 kHz to 30 MHz	Inductive devices, Generic use
Transmit and Receive	3 155 kHz to 3 400 kHz	Inductive devices, Generic use
Transmit and Receive	4 234 kHz	Inductive devices, Railway applications
Transmit and Receive	4 516 kHz	Inductive devices, Railway applications
Transmit and Receive	6 765 kHz to 6 795 kHz	Inductive devices, Generic use
Transmit and Receive	7 400 kHz to 8 800 kHz	Inductive devices, Generic use
Transmit and Receive	10 200 kHz to 11,000 MHz	Inductive devices, Generic use
Transmit and Receive	11,810 MHz to 15,310 MHz	RFID only
Transmit and Receive	12,5 MHz to 20 MHz	Inductive devices, Wireless healthcare

	Frequency Bands/frequencies	Applications
Transmit and Receive	13,553 MHz to 13,567 MHz	Inductive devices, Generic use
Transmit and Receive	26,957 MHz to 27,283 MHz	Inductive devices, Generic use
Transmit and Receive	27,095 MHz	Inductive devices, Railway applications

NOTE 1: It should be noted that table 1 represents the most widely implemented position within the European Union and the CEPT countries, but it should not be assumed that all designated bands are available in all countries.

NOTE 2: In addition, it should be noted that other frequency bands may be available in a country within the frequency range 9 kHz to 30 MHz covered by the present document.

NOTE 3: On non-harmonized parameters, national administrations may impose certain conditions such as the type of modulation, frequency, channel/frequency separations, maximum transmitter radiated power, duty cycle, and the inclusion of an automatic transmitter shut-off facility, as a condition for the issue of an Individual Rights for use of spectrum or General Authorization, or as a condition for use under "licence exemption" as it is in most cases for Short Range Devices.

The present document covers fixed stations, mobile stations and portable stations.

Applications using Ultra-WideBand (UWB) technology are not covered by the present document.

## 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 reference document (including any amendments) applies.

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The following referenced documents are necessary for the application of the present document.

- [1] ETSI TR 100 028 (all parts) (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [2] CISPR 16-1-4: "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 reference 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] CEPT/ERC/REC 70-03: "Relating to the use of Short Range Devices (SRD)".
- [i.2] Recommendation ITU-T O.153: "Basic parameters for the measurement of error performance at bit rates below the primary rate".

- [i.3] ANSI C63.5: "American National Standard for Electromagnetic Compatibility-Radiated Emission Measurements in Electromagnetic Interference (EMI) Control-Calibration of Antennas (9 kHz to 40 GHz)".
- [i.4] 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 (R&TTE Directive).
- [i.5] 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.6] 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.7] 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.8] ECC report 208: "Impact of RFID devices on radio services in the band 13.56 MHz".
- [i.9] ISO 14443: "Identification cards -- Contactless integrated circuit cards -- Proximity cards".
- [i.10] ISO 15693: "Information technology -- Radio frequency identification for item management -- Unique identification for RF tags".
- [i.11] ISO 18000-3: "Information technology -- Radio frequency identification for item management -- Part 3: Parameters for air interface communications at 13.56 MHz".
- [i.12] Void.
- [i.13] CENELEC EN 62311: "Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)".
- [i.14] CENELEC EN 62479: "Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)".
- [i.15] CENELEC EN 55011: "Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement".
- [i.16] Void.
- [i.17] ETSI EN 300 220 (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 25 MHz to 1 000 MHz frequency range with power levels ranging up to 500 mW".
- [i.18] ETSI EN 300 440 (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 1 GHz to 40 GHz frequency range".
- [i.19] ETSI EN 301 489-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements".
- [i.20] ETSI EN 301 489-3: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz".
- [i.21] ETSI EN 301 489-17: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment; Part 17: Specific conditions for Broadband Data Transmission Systems".

- [i.22] ETSI EN 300 328: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".
- [i.23] ETSI EN 300 330: "ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); 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".
- [i.24] Recommendation ITU-T O.41: "Psophometer for use on telephone-type circuits".
- [i.25] Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to Electrical Equipment designed for use within certain voltage limits (LVD).
- [i.26] ITU Radio Regulations.
- [i.27] Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC Text with EEA relevance (EMCD).

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

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

**alarm:** use of radio communication or a sensing device for indicating alert information at a distant location

**artificial antenna:** tuned reduced-radiating dummy load equal to the nominal impedance specified by the provider

**assigned frequency band:** frequency band within which the device is authorized to operate

**battery:** receiving part of a WPT system, a combination a receiving coil and battery in one housing

**battery emulator:** receiving part of a WPT systems, which emulates the battery and the receiving coil

**charger:** stationary part of the Wireless Power Transfer (WPT) system supplying energy to a receiving part

**conducted measurements:** measurements which are made using a direct connection to the equipment under test

**customized antenna:** antenna built according to manufacturers' antenna design rules inside tested limits

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

NOTE: The antenna has been designed or developed for one or more specific types of equipment. It is the combination of dedicated antenna and radio equipment that is expected to be compliant with the regulations.

**fixed station:** equipment intended for use in a fixed location

**H-field test antenna:** electrically screened loop or equivalent antenna, with which the magnetic component of the field can be measured

**identification system:** equipment consisting of a transmitter(s), receiver(s) (or a combination of the two) and an antenna(s) to identify objects by means of a transponder

**integral antenna:** antenna designed as a fixed part of the equipment, without the use of an external connector and as such which cannot be disconnected from the equipment by the user

**magnetic dipole moment:** product of (Number of coil turns)  $\times$  (coil area)  $\times$  (coil current)

NOTE: Air coils only.

**medical device:** any instrument, apparatus, appliance, software, material or other article, whether used alone or in combination, together with any accessories, including the software intended by its manufacturer to be used specifically for diagnostic and/or therapeutic purposes and necessary for its proper application, intended by the manufacturer to be used for human beings for the purpose of:

- diagnosis, prevention, monitoring, treatment or alleviation of disease;
- diagnosis, monitoring, treatment, alleviation of or compensation for an injury or handicap;
- investigation, replacement or modification of the anatomy or of a physiological process;
- control of conception;

and which does not achieve its principal intended action in or on the human body by pharmacological, immunological or metabolic means, but which may be assisted in its function by such means

**mobile station:** equipment normally installed in a vehicle

**portable station:** equipment intended to be carried, attached or implanted

**radiated measurements:** measurements which involve the absolute measurement of a radiated field

**receiving part:** receiving or second coil of a WPT system

**spurious emissions:** emissions on a frequency or frequencies which are outside the occupied bandwidth and the level of which may be reduced without affecting the corresponding transmission of information

**telecommand:** use of radio communication for the transmission of signals to initiate, modify or terminate functions of equipment at a distance

**telemetry:** use of radio communication for indicating or recording data at a distance

**transponder:** device that responds to an interrogation signal

**type designation:** providers' marking of the equipment

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## 3.2 Symbols

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

$\Omega$	ohm
A	loop antenna area
C	correction factor
E	electrical field strength
f	frequency
$f_C$	carrier frequency in Hz
H	magnetic field strength
H <sub>ef</sub>	H field-strength generated by an e-field antenna
H <sub>f</sub>	H-field-strength limit
H <sub>C</sub>	carrier H-field strength
H <sub>S</sub>	H-field-strength limit for radiated spurious emissions
I <sub>C</sub>	transmitter carrier output current
I <sub>S</sub>	transmitter spurious output current
$\lambda$	Wave length
m	magnetic dipole moment
N	number of turns for a loop antenna
P	Power
t	time

### 3.3 Abbreviations

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

ASK	Amplitude Shift Keying
BER	Bit Error Margin
CEPT	Conférence Européenne des Postes et Télécommunications
CISPR	Comité International Spécial des Perturbations Radioélectriques
e.r.p.	effective radiated power
EAS	Electronic Article Surveillance
EC	European Community
EMC	ElectroMagnetic Compatibility
EMF/emf	ElectroMagnetic Field
ERC	European Radiocommunications Committee
EUT	Equipment Under Test
HF	High Frequency (range)
ISM	Industrial, Scientific and Medical
ITU-T	ITU-Telecommunication sector
LF	Low Frequency
ND	Noise and Distortion
NFC	Near Field Communication
NIA	Product of $N$ (the number of turns of the loop coil) $\times I$ (current in the loop coil) $\times A$ (the area of the loop coil antenna)
NRI	National Radio Interfaces
OATS	Open Area Test Site
PSTN	Public Switched Telephone Network
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
RFID	Radio Frequency IDentification
SND	Signal, Noise and Distortion
SND/ND	Signal, Noise and Distortion over Noise and Distortion
SRD	Short Range Device
TR	Technical Report
UWB	Ultra Wideband
VSWR	Voltage Standing Wave Ratio
WPT	Wireless Power Transfer

## 4 Technical requirements specifications

### 4.1 General requirements

#### 4.1.1 Receiver categorization

The product family of short range radio devices is divided into three receiver categories, see table 2, each having its own set of minimum performance criteria. This classification is based upon the impact on persons in case the equipment does not operate above the specified minimum performance level.

**Table 2**

Receiver categories	Relevant receiver clauses	Risk assessment of receiver performance
1	8.1, 8.2 and 8.3	Safety critical SRD communication media; i.e. for devices serving systems where failure may result in a physical risk to a person.
2	8.2 and 8.3	Function critical SRD communication media; i.e. when a failure to operate correctly causes loss of function but does not constitute a safety hazard.
3	8.3	Non-critical SRD communication media whose failure to operate correctly causes loss of function which can be overcome by parallel means.
NOTE: With reference to the present document manufacturers are recommended to declare the categorization of their devices in accordance with table 2, as relevant. In particular where an SRD which may have an inherent safety of human life implication, manufacturers and users should pay particular attention to the potential for interference from other systems operating in the same or adjacent bands.		