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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".

National transposition dates

| | |
|--|------------------|
| Date of adoption of this EN: | 20 February 2015 |
| Date of latest announcement of this EN (doa): | 31 May 2015 |
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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 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 ± 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.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://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] 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

3.2 Symbols

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

| | |
|-----------------|--|
| Ω | 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 _{ef} | H field-strength generated by an e-field antenna |
| H _f | H-field-strength limit |
| H _C | carrier H-field strength |
| H _S | H-field-strength limit for radiated spurious emissions |
| I _C | transmitter carrier output current |
| I _S | transmitter spurious output current |
| λ | 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. | | |