



SLOVENSKI STANDARD
SIST EN 303 447 V1.3.1:2022

01-september-2022

Naprave kratkega dosega (SRD) - Harmonizirani standard za dostop do radijskega spektra - Sistemi z indukcijsko zanko za robotske kosilnice, ki delujejo v frekvenčnem območju od 100 Hz do 148,5 kHz

Short Range Devices (SRD) - Harmonised Standard for access to radio spectrum - Inductive loop systems for robotic mowers operating within the frequency range 100 Hz to 148,5 kHz

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**Short Range Devices (SRD);
Harmonised Standard for access to radio spectrum;
Inductive loop systems for robotic mowers operating
within the frequency range 100 Hz to 148,5 kHz**

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Contents

Intellectual Property Rights	5
Foreword.....	5
Modal verbs terminology.....	6
Introduction	6
1 Scope	7
2 References	7
2.1 Normative references	7
2.2 Informative references.....	8
3 Definition of terms, symbols and abbreviations.....	9
3.1 Terms.....	9
3.2 Symbols.....	11
3.3 Abbreviations	11
4 Technical requirements specifications	11
4.1 Environmental profile.....	11
4.2 General	11
4.2.1 Wanted technical performance criteria	11
4.2.2 RMI modes	12
4.2.2.1 General.....	12
4.2.2.2 Operational Modes.....	12
4.2.2.3 Safe Mode	12
4.2.3 Presentation of equipment for testing purposes	12
4.3 Transmitter conformance requirements.....	13
4.3.1 Operating Frequency Range (OFR).....	13
4.3.1.1 Applicability.....	13
4.3.1.2 Description.....	13
4.3.1.3 Limits	13
4.3.1.4 Conformance.....	13
4.3.2 Transmitter H-field requirements	14
4.3.2.1 Applicability.....	14
4.3.2.2 Description.....	14
4.3.2.3 Limits	14
4.3.2.4 Conformance.....	14
4.3.3 Transmitter spurious emissions.....	14
4.3.3.1 Applicability.....	14
4.3.3.2 Description	14
4.3.3.3 Limits	15
4.3.3.4 Conformance.....	16
4.3.4 Transmitter Out Of Band (OOB) emissions	16
4.3.4.1 Applicability.....	16
4.3.4.2 Description	16
4.3.4.3 Limits	16
4.3.4.4 Conformance.....	16
4.4 Receiver conformance requirements	16
4.4.1 Introduction.....	16
4.4.2 Receiver Spurious Emissions.....	16
4.4.2.1 Applicability.....	16
4.4.2.2 Description	17
4.4.2.3 Limits	17
4.4.2.4 Conformance.....	17
4.4.3 Receiver Baseline Sensitivity	17
4.4.3.1 Applicability.....	17
4.4.3.2 Description	17
4.4.3.3 Limits	17
4.4.3.4 Conformance.....	17

4.4.4	Receiver Baseline Resilience	17
4.4.4.1	Applicability	17
4.4.4.2	Description	17
4.4.4.3	Limits	18
4.4.4.4	Conformance	18
5	Testing for compliance with technical requirements	18
5.1	Environmental conditions for testing	18
5.2	General conditions for testing	18
5.3	Artificial antenna	18
5.4	Measuring receiver	19
5	Conformance methods of measurement for transmitters and receivers	19
6.1	General	19
6.2	Transmitter conformance methods	20
6.2.1	OFR	20
6.2.2	H-field	21
6.2.3	Transmitter unwanted emissions (spurious and OOB emissions)	21
6.3	Receiver conformance methods	22
6.3.1	Receiver spurious emissions	22
6.3.2	Receiver Baseline Sensitivity	23
6.3.2.1	General	23
6.3.2.2	Receiver-Baseline Sensitivity Test	24
6.3.3	Receiver Baseline Resilience (RBR)	24
6.3.3.1	General	24
6.3.3.2	RBR Test 1: to test that the robotic mower can handle a lost signal	25
6.3.3.3	RBR Test 2: to test that the robotic mower can handle a passage of the boundary wire	26
Annex A (informative):	Relationship between the present document and the essential requirements of Directive 2014/53/EU	28
Annex B (normative):	Test sites and procedures	30
B.1	Boundary and dependent guidance loops	30
B.1.1	Artificial antenna for conducted measurements below 30 MHz	30
B.1.2	General setup and measurement procedure for the current measurement with artificial antenna	32
B.1.3	Differential mode measurement	33
B.1.4	Common mode measurement	34
B.1.5	The reference test garden	34
B.1.6	Test setup for verification artificial antenna	34
B.1.6.1	General	34
B.1.6.2	For Differential Mode Impedance verification	35
B.1.6.3	For Common Mode Impedance verification	35
B.2	Radiated measurements using anechoic chamber or open area test site	36
B.2.1	General	36
B.2.2	Radiated emission measurements < 30 MHz	36
B.2.3	Radiated emission measurements 30 MHz to 1 000 MHz	37
Annex C (informative):	Justification for missing RX-requirements from ETSI EG 203 336	38
C.1	Justification for other RX-requirements	38
Annex D (informative):	TX spurious emission limit assessment below 9 kHz	40
Annex E (informative):	Change history	41
History		42

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Foreword

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

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.6] 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.3].

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.

National transposition dates

Date of adoption of this EN:	27 June 2022
Date of latest announcement of this EN (doa):	30 September 2022
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 March 2023
Date of withdrawal of any conflicting National Standard (dow):	31 March 2024

Modal verbs terminology

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Introduction

The present document covers Robotic Mowers with Inductive loop systems (RMI) using the frequency range below 148,5 kHz. An RMI system includes:

- RMI docking station: charging stations for the robotic mower and the signal generator/antenna connecting point for the signals on the integral antenna and boundary wire.
- Robotic Mower: receiving part inside the RMI.
- Boundary Wire: user installed antenna.

The present document is structured as follows:

- Clauses 1, 2 and 3 provide a general description on the types of equipment covered by the present document and the definition of terms, symbols and abbreviations used.
- Clause 4 provides the technical requirements specifications, limits and conformance relative to transmitter and receiver.
- Clause 5 specifies the conditions and information for testing of the equipment and interpretation of the measurement results.
- Clause 6 specifies the required measurement methods.
- Annex A (informative) provides the relationship between the present document and the essential requirements of Directive 2014/53/EU [i.3].
- Annex B (normative) provides necessary information on used test sites and procedures.
- Annex C (informative) provides the justification for missing RX-requirements from ETSI EG 203 336 [i.5].
- Annex D (informative) provides information on TX spurious emission limit assessment below 9 kHz.
- Annex E (informative) provides information on Change history.

1 Scope

The present document specifies technical characteristics and methods of measurements for Robotic Mowers with Inductive loop systems (RMI) operating within the frequency range 100 Hz to 148,5 kHz.

The present document covers the following RMI systems:

- RMI1 systems: RMI systems without receive only mode
- RMI2 systems: RMI systems with receive only mode

NOTE 1: In RMI1 systems the robotic mower is not able to restart automatically if the boundary signal comes back after the loss of the boundary signal (safe mode, see clause 4.2.2.3), while in RMI2 systems the robotic mower is able to restart automatically after the boundary signal is back. This differentiation has been introduced to cover receiver spurious emissions for RMI2 systems.

These radio equipment types are capable of operating in all or part of the frequency bands given in table 1.

Table 1: Permitted range of operation

Permitted range of operation	
Transmit	100 Hz to 148,5 kHz
Receive	100 Hz to 148,5 kHz
NOTE:	It should be noted that the frequency range between 9 kHz and 148,5 kHz is EU wide harmonised for inductive Short Range Devices according to EC Decision 2017/1483/EU [i.2].

NOTE 2: The relationship between the present document and essential requirements of article 3.2 of Directive 2014/53/EU [i.3] is given in Annex A.

The present document only covers RMI systems with antenna sizes smaller than 1,67 km, see CEPT/ERC/REC 70-03 [i.1], Annex 9.

NOTE 3: The antenna size is described by the distance between those two points on the antenna that have the largest distance between them (e.g. for a rectangle shaped antenna the largest diagonal; for a circular shaped antenna the diameter).

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.

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] ETSI EN 300 330 (V2.1.1) (02-2017): "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 Directive 2014/53/EU".

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] CEPT/ERC/REC 70-03: "Relating to the use of Short Range Devices (SRD)".
- [i.2] Commission Implementing Decision (EU) 2017/1483 of 8 August 2017 amending Decision 2006/771/EC on harmonisation of the radio spectrum for use by short-range devices and repealing Decision 2006/804/EC.
- [i.3] 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.
- [i.4] CEPT/ERC/REC 74-01: "Unwanted emissions in the spurious domain".
- [i.5] ETSI EG 203 336 (V1.2.1): "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".
- [i.6] 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.7] EGMF Robotic Mowers Boundary Wire Standard RLM003-1.1/2016.
- [i.8] EN 50636-2-107:2015: "Safety of household and similar appliances - Part 2-107: Particular requirements for robotic battery powered electrical lawnmowers", produced by CENELEC.
- [i.9] Void.
- [i.10] ETSI EN 303 454 (V1.1.1): "Short Range Devices (SRD); Metal and object detection sensors in the frequency range 1 kHz to 148,5 kHz; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU".
- [i.11] Void.
- [i.12] Void.
- [i.13] EN 55016-1-1:2010 + A1:2010 + A2:2014: "Specification for radio disturbance and immunity measuring apparatus and methods -Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus", produced by CENELEC.
- [i.14] ETSI TS 103 567 (V1.1.1): "Requirements on signal interferer handling".
- [i.15] ETSI TS 103 051 (V1.1.1) (08-2011): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Expanded measurement uncertainty for the measurement of radiated electromagnetic fields".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 300 330 [1] and the following apply:

99 % OBW function: measurement function of a spectrum analyser to measure the OBW

antenna: integral antenna, boundary loop, and/or guidance loop (both dependent and independent) which are used in the RMI

NOTE 1: The inductive wire loops are installed dependent from the shape of the garden.

NOTE 2: To clarify the different loops see figure 2.

boundary loop: inductive wire loop which is defined by manufacturer and prepared by the user

NOTE 1: It can be implemented as a single or multiple turn coil installed by the user in accordance with instruction from the manufacturer for the purpose of generating magnetic fields to determine the working area.

NOTE 2: To clarify the different loops see figure 2.

dependent guidance loop: guidance loop which is connected to boundary loop (e.g. via a T-junction) and the RMI docking station

NOTE: To clarify the different loops see figure 2.

guidance loop: inductive wire loop which is defined by manufacturer and prepared by the user

NOTE: To clarify the different loops see figure 2.

inductive loop: all electrical loop either wire or coil, where current is fed in order to generate a magnetic field intended for guidance and/or communication with the robotic mower

NOTE: In figure 2 different inductive loops are shown and named based on their function within the RMI system, e.g. boundary loop, guidance loop.

integral antenna: single or multiple turn inductive loop preinstalled inside the RMI docking station

NOTE: To clarify the different loops see figure 2.

integral receiving antenna: single or multiple turn inductive loop preinstalled inside the robotic mower

Occupied BandWidth (OBW): width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to 0,5 % of the total mean power of a given emission

NOTE: To clarify Occupied BandWidth (OBW), see figure 1.

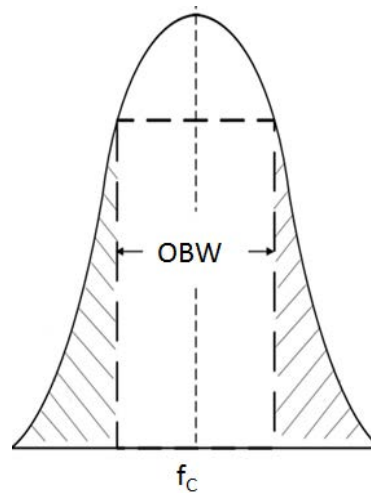


Figure 1: Occupied BandWidth (OBW)

RMI docking station: charging station for the robotic mower and the signal generator for the inductive loop(s) and, if applicable, integral antenna(s)

NOTE: The RMI docking station can be seen as the signal generator/antenna connecting point. In addition, it is the automatic battery charging facility located on or within the working area.

robotic mower: mobile part of the RMI including cutting means

NOTE: It is the receiving part inside the RMI.

Robotic Mower with Inductive loop system (RMI): system that includes robotic mower, power supply, docking station, and inductive loop(s)

working area: area in which the RMI can function

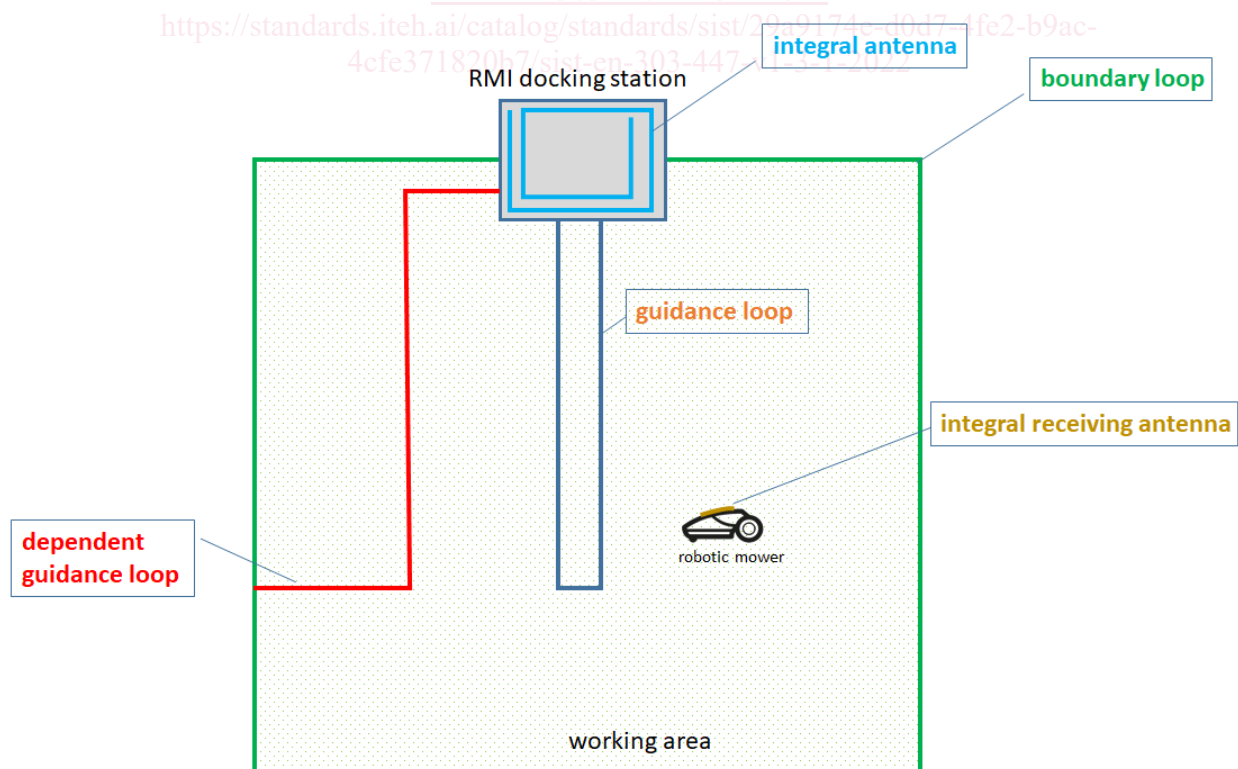


Figure 2: Overview of an RMI system, including the different possible antenna/loops

3.2 Symbols

For the purposes of the present document, the symbols given in ETSI EN 300 330 [1] and the following apply:

C_A	filtering capacitors of the artificial antenna
f_C	centre frequency of the OFR
f_H	highest frequency of the OFR
f_L	lowest frequency of the OFR
f_{SH}	higher frequency border between OOB and spurious domain
f_{SL}	lower frequency border between OOB and spurious domain
I_{CM}	common mode current
I_{DM}	differential mode current
L_A	inductive part of the artificial antenna
R_A	low frequency resistive part of the artificial antenna
R_C	common mode resistive part of the artificial antenna
R_D	high frequency resistive part of the artificial antenna
t_{SWT}	swept time for TX measurement

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI EN 300 330 [1] and the following apply:

CDMA	Code Division Multiple Access
CF	Conversion Factor
CM	Common Mode
CW	Continuous Wave
DM	Differential Mode
EGMF	European Garden Machinery industry Federation
IHR	Interferer Handling Requirements
LO	Local Oscillator
OBW	Occupied BandWidth
OFR	Operating Frequency Range
OOB	Out Of Band
PT SRD-MG	Project Team Short Range Device-Maintenance Group
RBR	Receiver Baseline Resilience
RMI	Robotic Mower with Inductive loop system
RX	Receiver
TX	Transmitter
WG FM	Working Group Frequency Management

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 General

4.2.1 Wanted technical performance criteria

In general, the robotic mower shall stay in its current operational mode (see clause 4.2.2.2), this is the wanted technical performance criteria of the RMI system.