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Naprave kratkega dosega (SRD) - Naprave za radijsko sondiranje tal in zidov (GPR/WPR) - Harmonizirani standard za dostop do radijskega spektra

Short Range Devices (SRD) - Ground- and Wall- Probing Radio determination (GPR/WPR) devices - Harmonised Standard for access to radio spectrum

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**Short Range Devices (SRD);
Ground- and Wall- Probing Radio
determination (GPR/WPR) devices;
Harmonised Standard for access to radio spectrum**

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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.5] 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.

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

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).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document specifies the requirements for Ground- and Wall- Probing Radar imaging systems applications. Ground Probing Radars (GPR) and Wall Probing Radars (WPR) are used in survey and detection applications.

The scope is limited to GPR and WPR radars, which are imaging systems are designed to operate while in contact with, or in close proximity to the ground or the wall, and their emissions being directed into the ground or wall (e.g. measured by a proximity sensor or imposed by the mechanical design). It does not include radars operated from aircraft or spacecraft.

The GPR/WPR applications in the present document are not intended for communications purposes, and the intended signal is not radiated into free space.

The emissions into the air resulting from the operation of GPR/WPR imaging systems are therefore defined as those emissions radiated in all directions above the ground from the GPR/WPR equipment, including direct emissions from the housing/structure of the equipment and emissions reflected or passing through the media under inspection (referred in ECC/DEC/(06)08 [i.2] and in the present document as "undesired emissions"); they are therefore dependent on the operational conditions and are meaningful only if the GPR/WPR are coupled with the material being investigated. Figure 1 shows the scenario to be considered for the emissions radiated into the air by GPR/WPR.

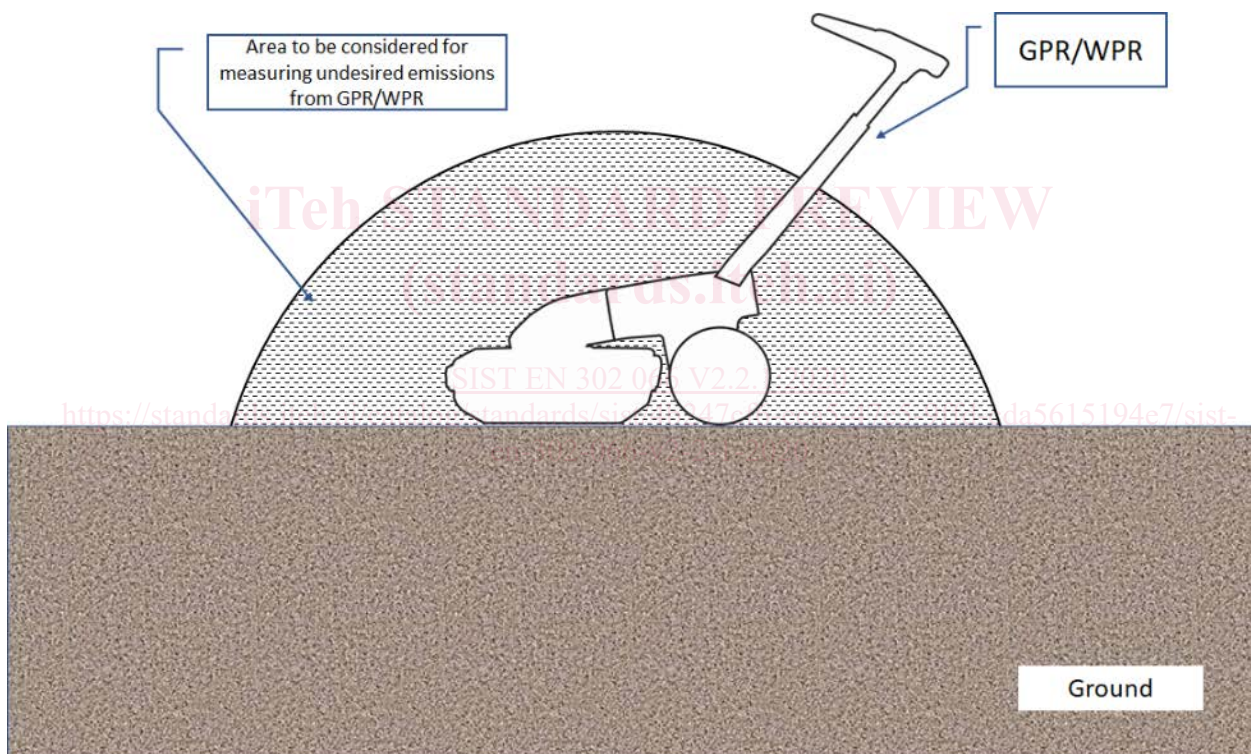


Figure 1: Hatched area around the GPR/WPR shows the emissions to be considered in this clause

NOTE 1: Equipment covered by the present document is intended to be used by competent professional personnel.

The present document applies to:

- 1) Ground Probing Radars (GPR) operating in the frequency range 30 MHz to 12,4 GHz radiating directly downwards into the ground.
- 2) Wall Probing Radars (WPR) operating in the frequency range 30 MHz to 12,4 GHz radiating directly into a "wall". The "wall" is a building material structure, the side of a bridge, the wall of a mine or another physical structure that absorbs a significant part of the signal transmitted by the radar.

These equipment can either:

- 1) be fitted with integral antennas and without antenna connector; or

- 2) use different imaging heads (antennas) with an antenna connector, to allow operation at different operating bandwidths frequencies.

NOTE 2: Equipment covered by the present document operates in accordance with ECC/DEC(06)08 [i.2].

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

Table 1: Permitted ranges of operation

Permitted range of operation	
Transmit	30 MHz to 12,4 GHz
Receive	30 MHz to 12,4 GHz
NOTE 1: Limits in table 2, clause 4.3.4 are to be met.	
NOTE 2: The frequency usage conditions for GPR/WPR are not fully harmonised in the EU and CEPT. Some National Regulatory Authorities (NRAs) may not have a general frequency allocation for GPR/WPT and may have established individual licensing requirements (e.g. registration of the user). Annex 2 of ECC/DEC/(06)08 [i.2] gives some guidance to administrations.	

NOTE 3: 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.

2 References

2.1 Normative references

References are specific, identified by date of publication and/or edition number or version number. Only the cited version 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 303 883 (V1.1.1) (09-2016): "Short Range Devices (SRD) using Ultra Wide Band (UWB); Measurement Techniques".
- [2] ETSI TS 103 361 (V1.1.1) (03-2016): "Short Range Devices (SRD) using Ultra Wide Band technology (UWB); Receiver technical requirements, parameters and measurement procedures to fulfil the requirements of the Directive 2014/53/EU".
- [3] CENELEC EN 55016-1-1 (March 2010 + A1 October 2010 + A2 September 2014): "Specification for radio disturbance and immunity measuring apparatus and methods; Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus".

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.
- [i.2] ECC/DEC/(06)08: "ECC Decision of 1 December 2006 on the conditions for use of the radio spectrum by Ground- and Wall- Probing Radar (GPR/WPR) imaging systems".
- [i.3] 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".
- [i.4] Void.
- [i.5] 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.6] ETSI EG 203 336 (V1.1.1) (08-2015): "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".
- [i.7] Recommendation ITU-R SM.1755: "Characteristics of ultra-wideband technology".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 303 883 [1] and the following apply:

footsize: outside dimension of the DUT in the horizontal plane

Pulse Repetition Frequency (PRF): inverse of the Pulse Repetition Interval (PRI), averaged over a sufficiently long time to cover all PRI variations

Pulse Repetition Interval (PRI): time between the rising edges of the transmitted (pulsed) output power

small GPR/WPR: GPR/WPR having its largest dimension up to 1 meter in the horizontal plane

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

time window: length of time that the GPR/WPR receiver is activated to collect reflections from a single transmitted signal

undesired emissions: emissions radiated in all directions above the ground from the GPR/WPR equipment, including direct emissions from the housing/structure of the equipment and emissions reflected or passing through the media under inspection (see ETSI EG 203 336 [i.6])

user manual: end user documentation to be included with the device

3.2 Symbols

For the purposes of the present document, the symbols given in ETSI EN 303 883 [1] and the following apply:

dB	DeciBel
dB _i	Gain in decibels relative to an isotropic antenna
D ₁	Difference between M and N
D ₂	Difference between M and I
E	Electrical field strength
f _c	Frequency at which the emission is the peak power at maximum
I	Signal recorded by the receiver in presence of the interferer
λ	Wavelength
M	Maximum signal for the receiver in the linear region of operation
N	Receiver noise level

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI EN 303 883 [1] and the following apply:

CEPT	European Conference of Postal and Telecommunications Administrations
DT	DwellTime
DUT	Device Under Test
e.r.p.	effective radiated power
GPR	Ground Probing Radar, Ground Penetrating Radar
PRF	Pulse Repetition Frequency
PRI	Pulse Repetition Interval
RNSS	Radio Navigation Satellite Service
RX	Receiver
SA	Spectrum Analyser
ST	ScanTime
TX	Transmitter
WPR	Wall Probing Radar

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4 Technical requirements specifications

4.1 Environmental conditions

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the manufacturer. The equipment shall comply with all the technical requirements of the present document which are identified as applicable in annex A at all times when operating within the boundary limits of the declared operational environmental profile.

4.2 General

UWB devices in the scope of the present document can operate in a broad permitted range of frequencies from 30 MHz to 12,4 GHz, as defined in table 1.

In order to clearly identify the required limits and thus measurement procedures it is essential to define the operational bandwidth of the UWB equipment under test. The operating bandwidth of the UWB equipment under test shall be the -10 dB bandwidth of the intended UWB signal under normal operational conditions as defined in clause 4.3.1.

A single UWB device can have more than one operational bandwidth. All UWB related emissions shall be measured in the identified operational bandwidth of the UWB device under test. The required mitigation techniques are only valid in the operational bandwidth.

The RX conformance test considers the dynamic range and the resilience of the receiver against interference signals in the operational bandwidth and on some clearly identified frequencies inside and outside the operational bandwidth(s), see clause 4.4.4.

Test site and general arrangements for compliance measurements are defined in clauses 6.1.1 and 6.1.2.

4.3 Transmitter Conformance Requirements

4.3.1 Operating Bandwidth

4.3.1.1 Applicability

This requirement shall apply to all DUT.

4.3.1.2 Description

The operating bandwidth(s) of GPR/WPR is/are the -10 dB bandwidth(s) of effective emissions radiated into the air by the equipment.

This definition is in accordance to appendix 1 of ECC/DEC(06)08 [i.2] and to Recommendation ITU-R SM.1755 [i.7].

4.3.1.3 Limits

Any operating bandwidth of all the DUT shall lie within the permitted frequency range of operation of the device (see table 1) and shall be > 50 MHz.

4.3.1.4 Conformance (standards.iteh.ai)

The conformance test suite for operating bandwidth shall be as defined in clause 6.2.2.

4.3.2 Maximum value of mean power spectral density

There is no regulatory limit for the UWB maximum mean power spectral density in the main lobe of the GPR/WPR antenna (towards ground or wall) due to the nature of the GPR/WPR applications (see scope of the present document). The relevant mean power spectral density emissions (according to [i.2]) of the GPR/WPR device will be considered in clause 4.3.4 (undesired emission limit) and annex C (calculation of the mean power density).

4.3.3 Maximum value of peak power

There is no regulatory limit for the UWB maximum peak power in the main lobe of the GPR/WPR antenna (towards ground or wall) due to the nature of the GPR/WPR applications (see scope of the present document). The relevant peak power emissions (according to [i.2]) of the GPR/WPR device will be tested under clause 4.3.4 (undesired emissions limit).

4.3.4 All undesired emissions

4.3.4.1 Applicability

This requirement shall apply to all DUT.