

<b>STN</b>	<b>Zariadenia s krátkym dosahom (SRD) používajúce technológiu ultraširokého pásma (UWB) Harmonizovaná norma pre prístup k rádiovému spektru Časť 4: Materiálovo citlivé zariadenia Oddiel 4: Aplikácie snímania vonkajšieho materiálu pre pozemné vozidlá</b>	<b>STN EN 302 065-4-4 V1.1.1</b>  87 2065
------------	---	---

Short Range Devices (SRD) using Ultra Wide Band technology (UWB); Harmonised Standard for access to radio spectrum; Part 4: Material Sensing devices; Sub-part 4: Exterior material sensing applications for ground based vehicles

Táto norma obsahuje anglickú verziu európskej normy.  
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 09/22

Obsahuje: EN 302 065-4-4 V1.1.1:2022

135591



# ETSI EN 302 065-4-4 V1.1.1 (2022-06)



**Short Range Devices (SRD) using  
Ultra Wide Band technology (UWB);  
Harmonised Standard for access to radio spectrum;  
Part 4: Material Sensing devices;  
Sub-part 4: Exterior material sensing applications  
for ground based vehicles**

---

**Reference**DEN/ERM-TGUWB-601

---

**Keywords**harmonised standard, SRD, UWB

---

**ETSI**650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

---

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° w061004871

---

**Important notice**

---

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at [www.etsi.org/deliver](http://www.etsi.org/deliver).

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommitteeSupportStaff.aspx>

If you find a security vulnerability in the present document, please report it through our  
Coordinated Vulnerability Disclosure Program:

<https://www.etsi.org/standards/coordinated-vulnerability-disclosure>

---

**Notice of disclaimer & limitation of liability**

---

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

---

**Copyright Notification**

---

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2022.  
All rights reserved.

# Contents

Intellectual Property Rights .....	6
Foreword.....	6
Modal verbs terminology.....	7
Introduction .....	7
1 Scope .....	8
2 References .....	8
2.1 Normative references .....	8
2.2 Informative references.....	8
3 Definition of terms, symbols and abbreviations.....	9
3.1 Terms.....	9
3.2 Symbols.....	9
3.3 Abbreviations .....	10
4 Technical requirements specifications .....	11
4.1 Environmental profile.....	11
4.2 EUT categories .....	11
4.2.1 General.....	11
4.2.2 Categorization by Regulation .....	11
4.2.3 Categorization by Modulation .....	11
4.2.4 Categorization by Active Mitigation Techniques .....	11
4.2.5 Summary EVS EUT sub-categories.....	12
4.3 Transmitter requirements .....	12
4.3.1 General.....	12
4.3.2 Operating Frequency Range (OFR).....	12
4.3.2.1 Applicability.....	12
4.3.2.2 Description .....	12
4.3.2.3 Limits .....	13
4.3.2.4 Conformance.....	13
4.3.3 Indirect emissions .....	13
4.3.3.1 Applicability.....	13
4.3.3.2 Description.....	13
4.3.3.3 Limits for indirect emissions.....	14
4.3.3.3.1 EUT without any active mitigation techniques.....	14
4.3.3.3.2 EUT with active mitigation techniques .....	14
4.3.3.4 Conformance.....	15
4.3.4 TX unwanted emissions.....	15
4.3.4.1 Applicability.....	15
4.3.4.2 Description .....	15
4.3.4.3 Limits .....	15
4.3.4.4 Conformance.....	16
4.3.5 Total Radiated Power (TRP).....	16
4.3.5.1 Applicability.....	16
4.3.5.2 Description .....	16
4.3.5.3 Limits .....	16
4.3.5.3.1 Limits for EUT without active mitigation techniques .....	16
4.3.5.3.2 Limits for EUT with active mitigation technique.....	16
4.3.5.4 Conformance.....	17
4.3.6 Listen Before Talk (LBT).....	17
4.3.6.1 Applicability.....	17
4.3.6.2 Description .....	17
4.3.6.3 Limits .....	17
4.3.6.4 Conformance.....	17
4.3.7 Duty Cycle .....	17
4.3.7.1 Applicability.....	17
4.3.7.2 Description.....	18

4.3.7.3	Limits .....	18
4.3.7.4	Conformance .....	18
4.4	Receiver conformance requirements .....	18
4.4.1	General .....	18
4.4.2	Wanted technical performance criteria .....	19
4.4.3	Receiver Dynamic Range (RDR) .....	19
4.4.3.1	Applicability .....	19
4.4.3.2	Description .....	19
4.4.3.3	Limits .....	19
4.4.3.4	Conformance .....	19
4.4.4	Receiver Baseline Resilience (RBR) .....	19
4.4.4.1	Applicability .....	19
4.4.4.2	Description .....	20
4.4.4.3	Limits .....	20
4.4.4.4	Conformance .....	20
5	Testing for compliance with technical requirements .....	20
5.1	Environmental conditions for testing .....	20
5.2	General conditions for testing .....	20
5.3	Conformance test suites .....	20
5.3.1	General .....	20
5.3.2	EUT orientation and reference points .....	21
5.3.3	Test scenarios and setup for transmitter conformance tests .....	21
5.4	Conformance methods of measurement for transmitter .....	22
5.4.1	Operating Frequency Range (OFR) .....	22
5.4.2	Indirect emissions .....	23
5.4.2.1	General .....	23
5.4.2.2	Considerations for conformance tests for EUT without TRP assessment .....	24
5.4.2.3	Considerations for conformance tests for EUT with TRP assessment .....	24
5.4.2.4	Common conformance test procedure for TRP .....	25
5.4.3	TX unwanted emissions .....	25
5.4.4	Total Radiated Power (TRP) .....	25
5.4.5	Listen Before Talk (LBT) .....	26
5.4.6	Duty Cycle .....	26
5.5	Conformance methods of measurement for receiver .....	27
5.5.1	General for RDR and RBR conformance tests .....	27
5.5.2	Receiver Dynamic Range (RDR) .....	27
5.5.2.1	RDR test for EUT designed to analyse the ground below the vehicle .....	27
5.5.3	Receiver Baseline Resilience (RBR) .....	29
5.5.3.1	RBR test for EUT designed to analyse the ground below the vehicle .....	29
<b>Annex A (informative):</b>	<b>Relationship between the present document and the essential requirements of Directive 2014/53/EU .....</b>	<b>31</b>
<b>Annex B (informative):</b>	<b>General conditions for testing, measurement uncertainty and interpretation of the measurement results .....</b>	<b>33</b>
<b>Annex C (normative):</b>	<b>Category non-contact-based ground analysing sensor devices .....</b>	<b>34</b>
C.1	Description .....	34
C.2	Wanted Technical Performance Criteria (WTPC) and RX - requirement .....	34
C.2.1	Introduction .....	34
C.2.2	Performance criteria for EVS .....	34
C.2.3	Justification for missing RX requirements from ETSI EG 203 336 .....	35
C.3	Reference ground and sand pit .....	36
C.4	Conductive metal plate for measurements .....	36
C.4.1	Dimensions of metal cover plate for measurement purposes .....	36
C.4.2	Measurement of resistance .....	36
C.5	General Measurement setup .....	36

<b>Annex D (normative):</b>	<b>Interferer for RBR test.....</b>	<b>38</b>
D.1	Interferer requirements for RBR tests .....	38
D.1.1	General test frequencies for RBR tests.....	38
D.1.2	Test frequencies for EUT with OFR < 500 MHz .....	38
D.1.3	Test frequencies for EUT with OFR ≥ 500 MHz .....	39
D.1.4	Interferer power levels and modulation.....	39
D.2	Interferer test signals for EVS .....	40
D.2.1	Interferer test signals .....	40
D.2.2	Assessment if no interferer test signal provided at calculated test signals .....	41
D.3	List of interferer for RBR test; assessment procedure.....	42
D.3.1	General .....	42
D.3.2	Assessment list of relevant interferer .....	43
D.3.2.1	Considering .....	43
D.3.2.2	Several interferer within the same frequency range.....	43
D.3.2.3	Interferer overlapping in frequency range .....	43
D.3.2.4	Status of interferer .....	44
D.3.3	Kind of interferer signal .....	44
<b>Annex E (informative):</b>	<b>Change History .....</b>	<b>45</b>
History .....		46

# Intellectual Property Rights

## Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

## Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

# 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.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.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.

The present document is part 4, sub-part 4 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.13].

National transposition dates	
Date of adoption of this EN:	24 May 2022
Date of latest announcement of this EN (doa):	31 August 2022
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	28 February 2023
Date of withdrawal of any conflicting National Standard (dow):	29 February 2024

---

## 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.

---

## 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 Directive 2014/53/EU [i.3].

For the case of the present document, the applicable harmonised standard has been ETSI EN 302 065-4 (V1.1.1) [i.8], for Material Sensing devices using UWB technology below 10,6 GHz which was published in the OJEU without restriction at 12 April 2017.

In order to consider the above points, ETSI ERM TGUWB decided to develop more specific standards; this means instead of one generic ETSI EN 302 065-4 [i.8] standard for Material Sensing devices the following standard family ETSI EN 302 065-4-x for material sensing devices:

- ETSI EN 302 065-4-1: "Material Sensing devices; Sub-part 1: Building material analysis below 10,6 GHz".
- ETSI EN 302 065-4-2: "UWB Material Sensing devices for Security Scanning".
- ETSI EN 302 065-4-3: "Ground humidity and condition sensor".
- ETSI EN 302 065-4-4: "Material Sensing devices; Sub-part 4: Exterior material sensing applications for ground based vehicles".
- ETSI EN 302 065-4-5: "UWB surveillance devices for parking lot sensors below 10,6 GHz".

**NOTE:** The above list of standards represents the active work items at the time of finalizing the present document and the final structure of the ETSI EN 302 065-4-x family may change later.



---

# 1 Scope

The present document specifies the requirements for technical characteristics and methods of measurements for material sensing applications using UWB technology for external material sensing applications for ground-based vehicles.

The present document only covers non-contact based UWB material sensing devices according to ECC/DEC(07)01 [i.1] and Commission Decision 2019/785/EU [i.2].

NOTE: 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.

---

## 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 303 883-1 (V1.2.1) (02-2021): "Short Range Devices (SRD) and Ultra Wide Band (UWB); Part 1: Measurement techniques for transmitter requirements".
- [2] ETSI EN 303 883-2 (V1.2.1) (02-2021): "Short Range Devices (SRD) and Ultra Wide Band (UWB); Part 2: Measurement techniques for receiver requirements".
- [3] ETSI EN 302 066 (V2.2.1) (06-2020): "Short Range Devices (SRD); Ground- and Wall- Probing Radio determination (GPR/WPR) devices; Harmonised Standard for access to radio spectrum".

### 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] ECC/DEC/(07)01: "ECC Decision of 30 March 2007 on the harmonised use, exemption from individual licensing and free circulation of Material Sensing Devices using Ultra-Wideband (UWB) technology", amended on 26 June 2009, corrected on 18 November 2016 and amended on 8 March 2019.
- [i.2] 2019/785/EU: "Commission Implementing Decision (EU) 2019/785 of 14 May 2019 on the harmonisation of radio spectrum for equipment using ultra-wideband technology in the Union and repealing Decision 2007/131/EC (notified under document C(2019) 3461)".
- [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 Report 45: "Report from CEPT to the European Commission in response to the Fifth Mandate to CEPT on ultra-wideband technology to clarify the technical parameters in view of a potential update of Commission Decision 2007/131/EC"; Report approved on 21 June 2013 by the ECC.
- [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] Recommendation ITU-R SM.1755: "Characteristics of ultra-wideband technology".
- [i.7] ETSI EG 203 336 (V1.2.1) (05-2020): "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.8] ETSI EN 302 065-4 (V1.1.1): "Short Range Devices (SRD) using Ultra Wide Band technology (UWB); Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 4: Material Sensing devices using UWB technology below 10,6 GHz".
- [i.9] ECC/DEC/(20)/01: "ECC Decision of 20 November 2020 on the harmonised use of the frequency band 5945-6425 MHz for Wireless Access Systems including Radio Local Area Networks (WAS/RLAN)".
- [i.10] ETSI TS 136 101 (V16.8.0): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception (3GPP TS 36.101 version 16.8.0 Release 16)".
- [i.11] 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".
- [i.12] ECO Frequency Information System (cept.org).
- NOTE: Available at <https://efis.cept.org/>.
- [i.13] ETSI EN 302 065-1: "Short Range Devices (SRD) using Ultra Wide Band technology (UWB); Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 1: Requirements for Generic UWB applications".

**koniec náhľadu – text ďalej pokračuje v platenej verzii STN**