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**Naprave kratkega dosega (SRD) in ultra širokopasovna (UWB) tehnologija - 2. del:
Merilne tehnike za zahteve oddajnika**

Short Range Devices (SRD) and Ultra Wide Band (UWB) - Part 1: Measurement techniques for transmitter requirements

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Contents

| | |
|--|----|
| Intellectual Property Rights | 8 |
| Foreword..... | 8 |
| Modal verbs terminology..... | 8 |
| Introduction | 9 |
| 1 Scope | 10 |
| 2 References | 10 |
| 2.1 Normative references | 10 |
| 2.2 Informative references..... | 10 |
| 3 Definition of terms, symbols and abbreviations..... | 13 |
| 3.1 Terms..... | 13 |
| 3.2 Symbols..... | 16 |
| 3.3 Abbreviations | 18 |
| 4 Overview | 20 |
| 4.1 Information..... | 20 |
| 4.2 Basic information about UWB | 20 |
| 5 TX requirements..... | 21 |
| 5.1 General | 21 |
| 5.1.1 General Guidance on TX measurements | 21 |
| 5.1.2 Emission Concept | 21 |
| 5.1.2.1 General | 21 |
| 5.1.2.2 UWB - EUT | 21 |
| 5.2 Operating Frequency Range (OFR)..... | 22 |
| 5.2.1 Definition..... | 22 |
| 5.2.2 Conformance Test..... | 23 |
| 5.3 Radiated Power (RP)..... | 23 |
| 5.3.1 Mean e.i.r.p. | 23 |
| 5.3.1.1 Description | 23 |
| 5.3.1.2 Conformance..... | 23 |
| 5.3.1.3 Method with a Spectrum Analyser..... | 24 |
| 5.3.1.4 Method with an RMS Power Meter | 25 |
| 5.3.1.5 Method with a Spectrum Analyser for Mean e.i.r.p. averaged over T_{on} | 25 |
| 5.3.2 Mean e.i.r.p. Spectral Density..... | 26 |
| 5.3.2.1 Description, Mean e.i.r.p. Spectral Density within 1 MHz | 26 |
| 5.3.2.2 Guidance for Mean e.i.r.p. Spectral Density Conformance Tests | 26 |
| 5.3.2.3 Mean e.i.r.p. Spectral Density, averaged over 1 ms | 27 |
| 5.3.2.4 Mean e.i.r.p. Spectral Density, known signal repetition time, averaged over 1 ms..... | 28 |
| 5.3.2.5 Mean e.i.r.p. Spectral Density, known signal repetition time, averaged over signal repetition time | 30 |
| 5.3.3 Peak e.i.r.p. | 31 |
| 5.3.3.1 Description | 31 |
| 5.3.3.2 Conformance..... | 31 |
| 5.3.3.3 Peak e.i.r.p.: Method with a Spectrum Analyser..... | 31 |
| 5.3.3.4 Peak e.i.r.p. method with a Peak Power Meter..... | 32 |
| 5.3.4 Peak e.i.r.p. Spectral Density | 32 |
| 5.3.4.1 Peak e.i.r.p. Spectral Density within 50MHz | 32 |
| 5.3.4.1.1 Description | 32 |
| 5.3.4.1.2 Conformance | 32 |
| 5.3.4.1.3 Peak e.i.r.p. Spectral Density, General Method..... | 32 |
| 5.3.4.1.4 Peak e.i.r.p. Spectral Density, Sparse Spectral Line Method..... | 35 |
| 5.3.4.2 Peak e.i.r.p. within 1 GHz..... | 35 |
| 5.3.4.2.1 Description | 35 |
| 5.3.4.2.2 Conformance | 35 |
| 5.3.4.2.3 Peak e.i.r.p. within 1 GHz for FMCW modulated signals..... | 36 |
| 5.4 Other Emissions (OE) | 36 |

| | | |
|------------|--|----|
| 5.5 | TX Unwanted Emissions (TXUE)..... | 37 |
| 5.5.1 | Description..... | 37 |
| 5.5.2 | Limits for the TX Unwanted Emission..... | 38 |
| 5.5.3 | Conformance Test for TX Unwanted Emission..... | 38 |
| 5.5.3.1 | Conformance Test for the Spurious domain of TX Unwanted Emission..... | 38 |
| 5.5.3.1.1 | General..... | 38 |
| 5.5.3.1.2 | Step 1: Measurement with Peak Detector..... | 39 |
| 5.5.3.1.3 | Step 2a: RMS assessment over Burst duration (T_{on})..... | 40 |
| 5.5.3.1.4 | Step 2b: RMS assessment over signal repetition/measurement cycle..... | 40 |
| 5.5.3.2 | Conformance Test for the OOB domain of TX Unwanted Emission..... | 41 |
| 5.5.3.2.1 | General..... | 41 |
| 5.5.3.2.2 | Conformance test..... | 41 |
| 5.6 | Total Radiated Power (TRP)..... | 42 |
| 5.6.1 | Introduction..... | 42 |
| 5.6.2 | Description of Total Radiated Power (TRP_{XX})..... | 43 |
| 5.6.3 | General TRP_{XX} assessment based on radiated (e.i.r.p.) measurement..... | 45 |
| 5.6.4 | Conformance Test..... | 49 |
| 5.6.4.1 | General..... | 49 |
| 5.6.4.2 | Total Radiated Mean Power (TRP_{MP}) Conformance Assessment in steps..... | 49 |
| 5.6.4.3 | Total Radiated Peak Power (TRP_{PP}) Conformance Assessment in steps..... | 50 |
| 5.6.4.4 | Total Radiated Mean e.i.r.p. Spectral Density (TRP_{SD}) Conformance Assessment in steps..... | 51 |
| 5.7 | Indirect Emissions..... | 52 |
| 5.7.1 | Description..... | 52 |
| 5.7.2 | Guidance for Conformance Test..... | 56 |
| 5.8 | Transmit Power Control..... | 56 |
| 5.8.1 | Description..... | 56 |
| 5.8.2 | Guidance for Conformance Test..... | 57 |
| 5.9 | Detect and Avoid..... | 57 |
| 5.9.1 | Description..... | 57 |
| 5.9.2 | Limits..... | 57 |
| 5.9.2.1 | DAA Parameters..... | 57 |
| 5.9.2.2 | DAA NIM parameters..... | 58 |
| 5.9.2.3 | DAA test parameters..... | 58 |
| 5.9.3 | Conformance Test..... | 58 |
| 5.9.3.1 | Introduction..... | 58 |
| 5.9.3.2 | Initial Start-Up Test..... | 60 |
| 5.9.3.2.1 | Start-up Procedure..... | 60 |
| 5.9.3.2.2 | Test without a victim test signal during the <i>Minimum Initial Channel Availability Check</i> Time, $T_{avail_time_min}$ | 60 |
| 5.9.3.2.3 | Test with a victim test signal at the beginning of the <i>Minimum Initial Channel Availability</i> Check Time, $T_{avail_time_min}$ | 61 |
| 5.9.3.2.4 | Test with a victim test signal at the end of the <i>Minimum Initial Channel Availability Check</i> Time, $T_{avail_time_min}$ | 62 |
| 5.9.3.3 | In-Operation Test..... | 63 |
| 5.9.3.3.1 | General Points for In-Operation Test..... | 63 |
| 5.9.3.3.2 | In-Operation Test Procedure..... | 64 |
| 5.10 | Listen Before Talk (LBT)..... | 65 |
| 5.10.1 | Description..... | 65 |
| 5.10.2 | Limits..... | 66 |
| 5.10.3 | Conformance..... | 67 |
| 5.10.3.1 | Measurement Procedure..... | 67 |
| 5.10.3.2 | Test Set-Up..... | 67 |
| 5.10.3.3 | Test Signal Definition for LBT Mechanism in Band 2 and 3..... | 68 |
| 5.10.3.3.1 | Band 2: Mobile Satellite Service (MSS) Test Signal..... | 68 |
| 5.10.3.3.2 | Band 3: Land Mobile Service Test Signal..... | 68 |
| 5.10.3.4 | Test Signal Definition for LBT Mechanism in Band 1 and 4..... | 68 |
| 5.10.3.5 | Conformance Test to Measure the Timing for LBT within bands 1 and 4..... | 70 |
| 5.11 | Duty Cycle..... | 71 |
| 5.11.1 | Description..... | 71 |
| 5.11.2 | Conformance Test..... | 72 |
| 5.11.2.1 | Duty Cycle, Spectrum Analyser Method..... | 72 |
| 5.11.2.2 | Duty Cycle, Oscilloscope Method..... | 72 |

| | | |
|--|--|-----------|
| 5.11.2.3 | Duty Cycle Measurement procedures for FMCW, stepped-frequency and Pulsed Systems..... | 74 |
| 5.11.2.3.1 | General | 74 |
| 5.11.2.3.2 | Method 1: Diode Power Detector | 74 |
| 5.11.2.3.3 | Method 2: Spectrum Analyser | 75 |
| 5.11.2.3.4 | Method 3: Synchronized Spectrum Analysers..... | 76 |
| 5.11.2.4 | Duty Cycle Measurement Procedures within a frequency band for FMCW and stepped-frequency systems | 77 |
| 5.11.2.4.1 | General | 77 |
| 5.11.2.4.2 | Synchronized Spectrum Analysers | 78 |
| 5.12 | Antenna pattern/Antenna gain | 80 |
| 5.12.1 | Description..... | 80 |
| 5.12.2 | Conformance tests for external antennas | 81 |
| 5.12.2.1 | General | 81 |
| 5.12.2.2 | Determination against a known reference antenna..... | 82 |
| 5.12.2.2.1 | General | 82 |
| 5.12.2.2.2 | Measuring distance | 82 |
| 5.12.2.2.3 | Measurement equipment requirements..... | 82 |
| 5.12.2.2.4 | Test procedure | 83 |
| 5.12.2.3 | Test based on a radiated measurement | 84 |
| 5.12.2.3.1 | General | 84 |
| 5.12.2.3.2 | Measuring distance | 84 |
| 5.12.2.3.3 | Measurement equipment requirements..... | 84 |
| 5.12.2.3.4 | Test procedure | 85 |
| 5.12.3 | Conformance tests for integral antennas | 86 |
| 5.12.4 | Guidance to assess emissions levels above regulated elevations | 86 |
| Annex A (normative): General Considerations and test conditions | | 89 |
| A.1 | Overview | 89 |
| A.2 | Product Information | 89 |
| A.3 | Guidance on EUT Modulation for Testing..... | 90 |
| A.4 | Requirements in Case of EUT with Scanning Antennas..... | 90 |
| A.4.1 | Classification..... | 90 |
| A.4.2 | Measurement of Fixed Beam EUT..... | 90 |
| A.4.3 | Measurement of Constant Pattern EUT..... | 90 |
| A.4.4 | Measurement of Variable Pattern EUT | 91 |
| A.5 | Test Conditions, Power Supply and Ambient Temperatures | 91 |
| A.5.1 | General | 91 |
| A.5.2 | Power Sources | 91 |
| A.5.2.1 | Power Sources for Stand-Alone Equipment | 91 |
| A.5.2.2 | Power sources for plug-in radio devices | 91 |
| A.5.3 | Normal and Extreme Test Conditions | 91 |
| A.5.4 | Test set-ups under environmental profile | 91 |
| A.5.5 | Assessment procedures over environmental profile | 91 |
| A.6 | Choice of Equipment for Test Suites | 92 |
| A.6.1 | Choice of Model..... | 92 |
| A.6.2 | Presentation | 92 |
| A.7 | Testing of Host Connected Equipment and Plug-In Radio Devices | 92 |
| A.7.1 | General | 92 |
| A.7.2 | The Use of a Host or Test Fixture for Testing Plug-In Radio Devices..... | 92 |
| A.8 | Interpretation of the measurement results | 93 |
| A.8.1 | General points on interpretation of the measurement results | 93 |
| A.8.2 | Measurement uncertainty is equal to or less than maximum acceptable uncertainty | 93 |
| A.8.3 | Measurement uncertainty is greater than maximum acceptable uncertainty | 94 |
| Annex B (normative): Test setups | | 95 |
| B.1 | Introduction | 95 |

| | | |
|-----------------------------|---|------------|
| B.2 | Radiated measurements | 95 |
| B.2.1 | General | 95 |
| B.2.2 | Test Sites and General Arrangements for Measurements Involving the Use of Radiated Fields | 96 |
| B.2.2.1 | General | 96 |
| B.2.2.2 | Anechoic Chamber | 96 |
| B.2.2.3 | Anechoic Chamber with a Conductive Ground Plane | 97 |
| B.2.2.4 | Open Area Test Site (OATS) | 98 |
| B.2.2.5 | Measurement Antenna | 99 |
| B.2.2.6 | Substitution Antenna | 99 |
| B.2.2.7 | Measuring Antenna | 100 |
| B.2.2.8 | Minimum Requirements for Test Sites for Measurements above 18 GHz | 100 |
| B.2.3 | Guidance on the Use of a Radiation Test Site | 101 |
| B.2.3.1 | General on Guidance on the Use of a Radiation Test Site | 101 |
| B.2.3.2 | Verification of the Test Site | 101 |
| B.2.3.3 | Preparation of the EUT | 101 |
| B.2.3.4 | Power Supplies to the EUT | 102 |
| B.2.3.5 | Range Length | 102 |
| B.2.3.5.1 | General | 102 |
| B.2.3.5.2 | Practical Test Distances for Accurate Measurements | 102 |
| B.2.3.6 | Site Preparation | 103 |
| B.2.4 | Coupling of Signals | 103 |
| B.2.4.1 | General | 103 |
| B.2.4.2 | Data Signals | 104 |
| B.2.5 | Standard Radiated Test Methods | 104 |
| B.2.5.0 | Initial Measurement Steps | 104 |
| B.2.5.1 | General Information on Test Methods | 104 |
| B.2.5.2 | Calibrated Setup | 104 |
| B.2.5.3 | Substitution Method | 105 |
| B.2.6 | Standard calibration method | 105 |
| B.3 | Conducted Measurements | 107 |
| B.3.1 | General | 107 |
| B.3.2 | Conducted measurement via cable connection | 108 |
| B.3.3 | Conducted measurement via waveguide connection | 109 |
| B.3.4 | Determination of a radiated power e.i.r.p. based on a conducted measurement | 110 |
| B.4 | Detailed Information to Standard Test Methods | 111 |
| B.4.1 | Spherical Scan with Automatic Measurement Antenna Placement | 111 |
| B.4.1.1 | General | 111 |
| B.4.1.2 | Calibrated Setup | 115 |
| B.4.1.3 | Substitution Method | 116 |
| B.4.1.4 | Spherical Scan with Rotating EUT | 116 |
| B.4.1.4.1 | General | 116 |
| B.4.1.4.2 | Calibrated Setup | 120 |
| B.4.1.4.3 | Substitution Method | 120 |
| B.4.1.5 | Spherical Scan Other Methods | 121 |
| Annex C (normative): | Signal Timing parameters | 122 |
| C.1 | Descriptions | 122 |
| C.2 | Signal Types | 122 |
| C.2.1 | Pulsed signals | 122 |
| C.2.1.1 | General | 122 |
| C.2.1.2 | Consideration for pulsed based signals if $T_{dis} > T_{PRT}$ | 123 |
| C.2.1.3 | Consideration for pulsed based signals if $T_{dis} < T_{PRT}$ | 123 |
| C.2.2 | FMCW signals | 124 |
| C.2.2.1 | General | 124 |
| C.2.2.2 | Single FMCW sweep within signal repetition time | 124 |
| C.2.2.3 | Multiple FMCW sweeps within T_{rep} and $T_{dis} > t_{sweep,off}$ | 126 |
| C.2.2.4 | Multiple FMCW sweeps within T_{rep} and $T_{dis} < t_{sweep,off}$ | 127 |
| Annex D (normative): | All Emission Measurement | 131 |

| | | |
|-------------------------------|---|------------|
| D.1 | General | 131 |
| D.2 | First step | 131 |
| D.3 | Second step..... | 133 |
| Annex E (normative): | Guidance for a pre-scan of EUT operating frequency range(s) | 134 |
| Annex F (informative): | Measurement of peak e.i.r.p. and mean (average) e.i.r.p. of constant duty cycle wideband pulsed signals..... | 135 |
| F.1 | General | 135 |
| F.2 | Exemplary measurement of pulse signals | 135 |
| F.3 | Mean e.i.r.p. measurements..... | 136 |
| F.3.1 | General | 136 |
| F.3.2 | Method I: Zero span mode | 136 |
| F.3.3 | Method II: Channel power measurement | 137 |
| F.3.4 | Method III: Average power meters | 138 |
| F.4 | Peak e.i.r.p. measurements | 138 |
| F.4.1 | General | 138 |
| F.4.2 | Method I: Zero span mode - direct measurement | 138 |
| F.4.3 | Method II: Peak e.i.r.p. calculation | 139 |
| F.5 | Max and mean PSD..... | 140 |
| Annex G (normative): | TX Unwanted Emissions (TXUE) for EUT under ECC/DEC(22)03 | 142 |
| Annex H (informative): | Parameter and Specification in related Standards | 146 |
| Annex I (informative): | Change History | 150 |
| History | | 151 |

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Foreword

This draft 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 EN Approval Procedure.

The present document is part 1 of a multi-part deliverable covering Short Range Devices (SRD) and Ultra Wide Band (UWB), as identified below:

Part 1: "Measurement techniques for transmitter requirements";

Part 2: "Measurement techniques for receiver requirements".

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Introduction

Ultra Wide Band (UWB) radio technology enables a new generation of high-speed data devices for short-range communication purposes as well as location tracking and Sensor devices and opens new markets with a variety of innovative applications.

UWB devices may form an integral part of other portable electronic equipment such as future generation cellular phones or laptops equipped with UWB enabled short-range air interfaces.

In addition, UWB devices with an operating frequency range of several hundreds of MHz up to several GHz allow tens of centimetre-level accuracy real time localization and positioning even in the presence of severe multipath effects caused by walls, furniture or any other harsh radio propagation environments.

Based on the broad variety of different applications and the broad possible frequency range of operation the number of possible deployed physical signal formats can be very large. The existing range of physical signal and modulation formats range from traditional carrier based systems like OFDM over spread spectrum based system to carrier less systems based on base band pulses. The frequency regulation on the other side only defines a single set of transmission limits and values, which have to be fulfilled by all systems under the UWB regulation. Furthermore, the very high channel bandwidth of a UWB signal gives a specific challenge to the needed measurement setup and the procedures. Existing measurement procedures need to be extended and new possible techniques should be described in the present document.

The present document is structured as follows:

- Clauses 1 through 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 an overview on the technical and technology basics which were considered during the preparation of the present document.
- Clause 5 specifies EUT TX requirements and the related conformance procedure.
- Annex A provides information on test conditions, used test sites and procedures.
- Annex B provides necessary information on radiated test procedures.
- Annex C provides information on TX signal types.
- Annex D provides information on the all emission concept.
- Annex E provides information for a pre-scan radiated power measurement test procedure.
- Annex F provides information on differences between the different emission power measurements.
- Annex G provides information on Out-of-band and spurious requirements for EUT covered by ECC/DEC(22)03 [i.40].
- Annex H provides information what specifications, parameters, need to be considered in the related standard.
- Annex I provides a change history table containing the major technical changes.

1 Scope

The present document summarizes the available information of possible measurement techniques and procedures for the conformance measurement of various signal formats (e.g. Ultra Wide Band (UWB)) in order to comply with the given transmission limits given in the current regulation.

The present document could be used as a reference for existing and future ETSI standards covering UWB and other technologies.

2 References

2.1 Normative references

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

- [1] [ETSI TS 102 754 \(V1.3.1\) \(03-2013\)](#): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Technical characteristics of Detect And Avoid (DAA) mitigation techniques for SRD equipment using Ultra Wideband (UWB) technology".
- [2] [ETSI TS 102 321 \(V1.1.1\)](#): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Normalized Site Attenuation (NSA) and validation of a fully lined anechoic chamber up to 40 GHz".
- [3] [ETSI TS 103 941 \(V.1.1.1\)](#): "Ultra Wide Band (ERM); Radiated tests for UWB technology-based devices under extreme environmental conditions".

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] ETSI TS 103 060 (V1.1.1) (09-2013): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Method for a harmonized definition of Duty Cycle Template (DCT) transmission as a passive mitigation technique used by short range devices and related conformance test methods".
- [i.2] [ITU Radio Regulations](#).
- [i.3] [ECC/DEC\(06\)04](#): "The harmonised conditions for devices using UWB technology in bands below 10.6 GHz", 24 March 2006, amended 9 December 2011 and amended 8 March 2019.

- [i.4] [ECC/DEC\(07\)01](#): "The harmonised use, exemption from individual licensing and free circulation of Material Sensing Devices using Ultra-Wideband (UWB) technology", 30 March 2007, amended on 26 June 2009, corrected on 18 November 2016 and amended on 8 March 2019.
- [i.5] [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.6] [ECC/DEC\(11\)02](#): "Industrial Level Probing Radars (LPR) operating in frequency bands 6-8.5 GHz, 24.05-26.5 GHz, 57-64 GHz and 75-85 GHz", 11 March 2011, updated on 17 November 2017 and amended on 5 July 2019.
- [i.7] [ERC Recommendation 70-03](#): "Relating to the use of Short Range Devices (SRD)".
- [i.8] [Commission Implementing Decision \(EU\) 2019/1345 of 2 August 2019](#) amending Decision 2006/771/EC updating harmonised technical conditions in the area of radio spectrum use for short-range devices (notified under document C(2019) 5660).
- [i.9] [ERC Recommendation 74-01](#): "Unwanted Emissions in the spurious domain", latest amendment on 29 May 2019".
- [i.10] Recommendation ITU-R SM.329-12 (09/2012): "Unwanted emissions in the spurious domain".
- [i.11] [ECC/DEC\(06\)08](#): "The conditions for use of the radio spectrum by Ground- and Wall- Probing Radar (GPR/WPR) imaging systems", December 2016, updated on 26 October 2018.
- [i.12] ETSI EN 302 372 (V2.1.1) (12-2016): "Short Range Devices (SRD); Tank Level Probing Radar (TLPR) equipment operating in the frequency ranges 4,5 GHz to 7 GHz, 8,5 GHz to 10,6 GHz, 24,05 GHz to 27 GHz, 57 GHz to 64 GHz, 75 GHz to 85 GHz; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU".
- [i.13] [ECC/DEC\(04\)03](#): "The frequency band 77-81 GHz to be designated for the use of Automotive Short Range Radars" 19 March 2004.
- [i.14] ETSI TR 103 181-2 (V1.1.1) (06-2014): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD) using Ultra Wide Band (UWB);Transmission characteristics Part 2: UWB mitigation techniques".
- [i.15] ETSI TR 103 181-1 (V1.1.1) (07-2015): "Short Range Devices (SRD) using Ultra Wide Band (UWB); Technical Report Part 1: UWB signal characteristics and overview CEPT/ECC and EC regulation".
- [i.16] [ECC Report 120 \(06/2008\)](#): "Technical requirements for UWB DAA (Detect and Avoid) devices to ensure the protection of radiolocation services in the bands 3.1 - 3.4 GHz and 8.5 - 9 GHz and BWA terminals in the band 3.4 - 4.2 GHz".
- [i.17] ETSI EG 203 367 (V1.1.1) (06-2016): "Guide to the application of harmonised standards covering articles 3.1b and 3.2 of the Directive 2014/53/EU (RED) to multi-radio and combined radio and non-radio equipment".
- [i.18] ETSI TR 100 028 (all parts) (V1.4.1) (12-2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [i.19] Recommendation ITU-R SM.1754-0 (05-2006): "Measurement techniques of ultra-wideband transmissions".
- [i.20] ANSI C63.5-2017/Cor 1-2019: "American National Standard for Electromagnetic Compatibility--Radiated Emission Measurements in Electromagnetic Interference (EMI) Control - Calibration and Qualification of Antennas (9 kHz to 40 GHz) - Corrigendum 1".
- [i.21] ETSI TR 102 273 (all parts) (V1.2.1) (12-2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties".

- [i.22] ETSI TR 102 215 (V1.3.1) (11-2004): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Recommended approach, and possible limits for measurement uncertainty for the measurement of radiated electromagnetic fields above 1 GHz".
- [i.23] ECC Report 064: "The protection requirements of radiocommunications systems below 10.6 GHz from generic UWB applications".
- [i.24] Recommendation ITU-R SM.1755-0 (05/2006): "Characteristics of ultra-wideband technology".
- [i.25] ETSI TR 102 347 (V1.1.2) (01-2005): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Equipment for Detecting Movement; Radio equipment operating around e.g. 5,8 GHz, 10 GHz, 25 GHz, 61 GHz, 77 GHz; System Reference Document for Tank Level Probing Radar (TLPR)".
- [i.26] [ECC Report 139](#): "Impact of Level Probing Radars (LPR), using Ultra-Wideband Technology on Radiocommunications Services".
- [i.27] Recommendation ITU-R SM.1541-6 (08/2015): "Unwanted emissions in the out-of-band domain; SM Series".
- [i.28] ETSI EN 303 446-1 (V1.2.1) (10-2019): "ElectroMagnetic Compatibility (EMC) standard for combined and/or integrated radio and non-radio equipment; Part 1: Requirements for equipment intended to be used in residential, commercial and light industry locations".
- [i.29] ETSI EN 303 446-2 (V1.2.1) (10-2019): "ElectroMagnetic Compatibility (EMC) standard for combined and/or integrated radio and non-radio equipment; Part 2: Requirements for equipment intended to be used in industrial locations".
- [i.30] [RBW influence on peak or mean power measurement of pulsed signals](#), Application Note 6.2019-1EF106-1E, 06.06.2019.
- [i.31] ETSI EN 302 729-1 (V1.1.2) (05-2011): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Level Probing Radar (LPR) equipment operating in the frequency ranges 6 GHz to 8,5 GHz, 24,05 GHz to 26,5 GHz, 57 GHz to 64 GHz, 75 GHz to 85 GHz; Part 1: Technical characteristics and test methods".
- [i.32] [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 (RED).
- [i.33] CISPR 16-1-6:2014: "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-6: Radio disturbance and immunity measuring apparatus - EMC antenna calibration".
- [i.34] Antenna Pattern Measurement: Concepts and Techniques, Michael D. Foegelle, Compliance Engineering, Annual Reference Guide 2002.
- [i.35] Total Radiated Power Measurement above 1 GHz with Partially-Spherical Scanning of a Probe, EMC'09/Kyoto.
- [i.36] Sampling points reduction in spherical scanned TRP measurement, 2014 IEEE™ Conference on Antenna Measurements & Applications (CAMA), Electronic ISBN:978-1-4799-3678-6.
- [i.37] "A CTIA approved antenna measurement system for over-the-air testing of wireless devices", published in 2004 IEEE™ Antenna Measurements and SAR, AMS 2004, Print ISBN:0-86341-415-X.
- [i.38] IEEE 149-2021™: "IEEE Recommended Practice for Antenna Measurements".
- [i.39] CISPR 16-1-4 (Edition 4; 2019-01): "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".
- [i.40] [ECC/DEC\(22\)03](#): "Technical characteristics, exemption from individual licensing and free circulation and use of specific radiodetermination applications in the frequency range 116-260 GHz", 18 November 2022.