Final draft ETSI EN 302 729-1 V3.1.0 (2025-03)

Short Range Devices (SRD) using Ultra Wide Band technology (UWB); Harmonised standard for access to radio spectrum; Part 1: 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 for strictly vertical downward installation

Reference
REN/ERM-TGUWB-152

Keywords
harmonised standard, radar, short range, SRD,
testing, 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

Contents

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 IPR online database.

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™**, **LTE™** and **5G™** logo 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 final 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 Vote phase of the ETSI Standardisation Request deliverable Approval Procedure (SRdAP).

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.2] 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.

The present document is part 1 of a multi-part deliverable covering Short Range Devices (SRD) using Ultra Wide Band technology (UWB); Harmonised standard for access to radio spectrum, as identified below:

Part 1: "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 for strictly vertical downward installation";

Part 2: "Level Probing Radar (LPR) equipment operating in the frequency range 75 GHz to 85 GHz for tilted downward installation".

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.

Introduction

ETSI ERM TGUWB decided to develop more specific standards; this means instead of one generic ETSI EN 302 729 [i.13] for all Level Probing Radar (LPR) devices, a multi-part deliverable was initiated in order to reflect the intended use in relation to different aspects of the corresponding regulation ECC Decision (11)02 [i.3].

Part 1 of the multi-part deliverable covers the original provisions made in ECC Decision (11)02 [i.3] of 11 March 2011 for LPR equipment with strictly vertical downward installation (see ECC Decision (11)02 [i.3], first four lines of Table 1 for strictly vertical antenna orientation).

Part 2 of the multi-part deliverable covers the amendments made in ECC Decision (11)02 [i.3] on 5 July 2019 for LPR equipment with tilted downward installation (see ECC Decision (11)02 [i.3], last three lines of Table 1 for tilted antenna orientation).

Due to the amendment of ECC Decision (11)02 [i.3] on 5 July 2019, ETSI ERM TGUWB decided to follow henceforth a two part structure and to only reflect the amendments made in 2019 in part 2 of the series.

More information on the conducted changes in previous versions of the present document can be found in the change history in Annex H.

1 Scope

The present document specifies technical requirements, limits and test methods for 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 for strictly vertical downward installation in outdoor as well as indoor environments.

Level Probing Radars in the scope of the present document consist of a combined transmitter and receiver and are equipped with an integral or dedicated antenna provided also by the EUT manufacturer. EUTs intended to be equipped with antennas from third-party manufacturers are not covered by the scope of the present document.

LPR equipment and the related categorization is further specified in clause 4.2.

NOTE: 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 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 ETSI docbox.

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 (V2.1.1) (08-2024): "Short Range Devices (SRD) and Ultra Wide Band (UWB); Part 1: Measurement techniques for transmitter requirements".

[2] ETSI EN 303 883-2 (V2.1.1) (08-2024): "Short Range Devices (SRD) and Ultra Wide Band (UWB); Part 2: Measurement techniques for receiver requirements".

[3] ETSI TS 103 789 (V1.1.1) (05-2023): "Short Range Devices (SRD) and Ultra Wide Band (UWB); Radar related parameters and physical test setup for object detection, identification and RCS measurement".

[4] ETSI TS 103 941 (V1.1.1) (01-2024): "Short Range Devices (SRD) and Ultra Wide Band (UWB); Measurement setups and specifications for testing under full environmental profile (normal and 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] 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 (RE-Directive).

[i.2] 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.3] ECC Decision (11)02: "ECC Decision of 11 March 2011 and amended on 5 July 2019 on 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".

[i.4] ECC Report 139: "Impact of Level Probing Radars Using Ultra-Wideband Technology on Radiocommunications Services", Rottach-Egern, February 2010.

[i.5] CEPT ERC Recommendation 74-01 (May 2022): "Unwanted emissions in the spurious domain".

[i.6] ETSI TR 102 601 V1.1.1 (12-2007): "Electromagnetic compatibility and Radio spectrum Matters (ERM); System reference document; Short Range Devices (SRD); Equipment for Detecting Movement using Ultra Wide Band (UWB) radar sensing technology; Level Probing Radar (LPR)-sensor equipment operating in the frequency bands 6 GHz to 8,5 GHz; 24,05 GHz to 26,5 GHz; 57 GHz to 64 GHz and 75 GHz to 85 GHz".

[i.7] Commission Implementing Decision (EU) 2022/180 of 8 February 2022 amending Decision 2006/771/EC as regards the update of harmonised technical conditions in the area of radio spectrum use for short-range devices (notified under document C(2022) 644) (Text with EEA relevance).

[i.8] Committee on Radio Astronomy Frequencies, European Science Foundation.

[i.9] IEC 61298-2:2008: "Process measurement and control devices - General methods and procedures for evaluating performance - Part 2: Tests under reference conditions".

[i.10] 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.11] ETSI TS 103 567 (V1.1.1) (09-2019): "Requirements on signal interferer handling".

[i.12] 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.13] ETSI EN 302 729 (all parts): "Short Range Devices (SRD) using Ultra Wide Band technology (UWB); Harmonised standard for access to radio spectrum".

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 [1], ETSI EN 303 883-2 [2] and the following apply:

Adaptive Power Control (APC): automatic mechanism to reduce interference to other radio services and applications

NOTE 1: APC basically regulates the transmitter power based on the available signal-to-noise ratio of the current Rx-signal in order to reduce the emissions.

NOTE 2: The Adaptive Power Control (APC) is sometimes also called transmit power control.

Duty Cycle over measurement period (DC_T_{on}): ratio of the sum of all the pulse durations t_{pulse} within the active measurement period T_{on}

Duty Cycle over signal repetition period (DC_T_{rep}): ratio of the sum of all active measurement periods T_{on} (bursts, sweeps, scans) within the signal repetition period T_{rep}

Equipment Under Test (EUT): Level Probing Radar (LPR) under test

Frequency Modulated Continuous Wave (FMCW) radar: modulation scheme based on a periodically linear frequency sweep of the transmit signal

NOTE: See ETSI EN 303 883-1 [1], clause C.2.2.

pulsed radar (or here simply "pulsed LPR"): modulation scheme based on a periodically transmission of short RF pulses

NOTE: See ETSI EN 303 883-1 [1], clause C.2.1.

radiation: signals emitted intentionally for level measurements

step response time (of an LPR): time span after a sudden distance change until the output value (distance value) reaches 90 % of the final value for the first time

3.2 Symbols

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

t_{pulse}	pulse duration time in pulsed radar modulation schemes and dwell time or sweep time for FMCW modulation schemes

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI EN 303 883-1 [1], ETSI EN 303 883-2 [2] and the following apply:

APC	Adaptive Power Control
AUT	Antenna Under Test
DC	Duty Cycle
e.i.r.p.	equivalent isotropically radiated power
EC	European Commission
ECC	Electronic Communication Committee
EFTA	European Free Trade Union
ERC	European Radiocommunication Committee
EU	European Union
EUT	Equipment Under Test
FMCW	Frequency Modulated Continuous Wave
HPBW	Half Power BeamWidth
HPLPR	High Power Level Probing Radar
IEC	International Electrotechnical Commission
ITU-R	International Telecommunication Union - Radio sector
LPR	Level Probing Radar
LPLPR	Low Power Level Probing Radar
OFR	Operating Frequency Range
OOB	Out-Of-Band
RB	Reference Bandwidth
RBW	Resolution Bandwidth
RCS	Radar Cross Section
RF	Radio Frequency
RX	Receiver
SFCW	Stepped Frequency Continuous Wave
SNR	Signal to Noise Ratio
SRD	Short Range Device
TX	Transmitter
UK	United Kingdom
UWB	Ultra-Wideband
VBW	Video Bandwidth

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, but as a minimum, shall be that specified in the test conditions contained in the present document. 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 EUT categories

4.2.1 General

Technical and regulatory requirements for Level Probing Radars are provided in general in European Commission Implementing Decision (EU) 2022/180 [i.7] and ECC Decision (11)02 [i.3], which are based on ECC Report 139 [i.4]. The present document covers only the essential technical requirements set out in the first four rows in Table 1 of ECC Decision (11)02 [i.3] for LPR equipment using a strictly vertical downward orientation of the EUT antenna.

In addition, the manufacturer needs to consider further installation requirements as specified in Annex E and will have to provide this information to the user/installer. These installation requirements, however, are not subject to Annex A of the present document.

Receive-only devices, EUTs exhibiting a receive only mode or a standby mode are not covered by the scope of the present document.

A further sub-categorization of this LPR device category has been conducted based on:

- the output power, see clause 4.2.2;
- the used Operating Frequency Range (OFR), see clause 4.2.3;
- the used antenna connection, see clause 4.2.4.

The environmental conditions for testing are specified in clause 5.1.

4.2.2 Categorization by output power

The following sub-categorization of LPR EUTs by the output power is used:

- LP1: EUT is a low power LPR (LPLPR) device;
- LP2: EUT is a high power LPR (HPLPR) device.

More information on LP1 and LP2 devices can be found in clause 4.3.7.1.

NOTE: The LP1 category considers a reduced mean and peak power limit by 20 dB compared to ECC Decision (11)02 [i.3]. This reduction of transmit power is equivalent to the use of a mitigation technique as described in clause 4.3.7 and therefore no additional mitigation measures are necessary for the LP1 category.

4.2.3 Categorization by Operating Frequency Range (OFR)

The following sub-categorization of LPR EUTs by the operating frequency range is used:

- OFR1: OFR of the EUT is contained in the frequency range 6 GHz to 8,5 GHz;
- OFR2: OFR of the EUT is contained in the frequency range 24,05 GHz to 26,5 GHz;

- OFR3: OFR of the EUT is contained in the frequency range 57 GHz to 64 GHz;
- OFR4: OFR of the EUT is contained in the frequency range 75 GHz to 85 GHz.

This categorization has been conducted, reflecting the different permitted frequency ranges which can be used for Level Probing Radars in accordance with European Commission Implementing Decision (EU) 2022/180 [i.7] and ECC Decision (11)02 [i.3].

4.2.4 Categorization by antenna connection

The following sub-categorization of LPR EUTs by the antenna connection is used:

- ANT1: EUT features an antenna connector, e.g. the EUT is equipped with a dedicated antenna;
- ANT2: EUT has no antenna connector, e.g. the EUT is equipped with an integral antenna.

4.2.5 Summary of LPR sub-categories

An overview of the applicability of transmitter requirements and receiver requirements for the different LPR sub-categories is shown in Table 1 and Table 2, respectively.

Table 1: Applicability of transmitter requirements for the different LPR sub-categories

TX requirements	Clause	Categorization by sub-category		
		output power	operating frequency range	antenna connection
		LP1 and LP2	OFR1 to OFR4	ANT1 and ANT2
Operating frequency range	4.3.2	applicable to any category (LP1 and LP2)	applicable to any category (OFR1 to OFR4)	applicable to any category (ANT1 and ANT2)
Mean e.i.r.p. spectral density	4.3.3			
Peak e.i.r.p. spectral density	4.3.4			
Transmitter Unwanted Emissions (TXUE)	4.3.5			
Antenna requirements	4.3.6			
Mitigation techniques	4.3.7.1	only applicable to category LP2 (HPLPR)	applicable to any category (OFR1 to OFR4) only if the EUT is categorized as LP2 (HPLPR)	applicable to any category (ANT1 and ANT2) only if the EUT is categorized as LP2 (HPLPR)

Table 2: Applicability of receiver requirements for the different LPR sub-categories

RX requirements	Clause	Categorization by sub-category		
		output power	operating frequency range	antenna connection
		LP1 and LP2	OFR1 to OFR4	ANT1 and ANT2
Receiver Baseline Sensitivity (RBS)	4.4.3	applicable to any category (LP1 and LP2)	applicable to any category (OFR1 to OFR4)	applicable to any category (ANT1 and ANT2)
Receiver Baseline Resilience (RBR)	4.4.4			

The manufacturer shall indicate which LPR category (LPR1 to LPR16) applies to the available EUT (see Table 3). Only one category shall apply for each EUT.

Table 3: LPR categories based on the sub-categories listed in clause 4.2.1

LPR category	Categorization by sub-category		
	output power	operating frequency range	antenna connection
LPR1	LP1	OFR1	ANT1
LPR2	LP1	OFR1	ANT2
LPR3	LP1	OFR2	ANT1
LPR4	LP1	OFR2	ANT2
LPR5	LP1	OFR3	ANT1
LPR6	LP1	OFR3	ANT2
LPR7	LP1	OFR4	ANT1
LPR8	LP1	OFR4	ANT2
LPR9	LP2	OFR1	ANT1
LPR10	LP2	OFR1	ANT2
LPR11	LP2	OFR2	ANT1
LPR12	LP2	OFR2	ANT2
LPR13	LP2	OFR3	ANT1
LPR14	LP2	OFR3	ANT2
LPR15	LP2	OFR4	ANT1
LPR16	LP2	OFR4	ANT2

4.3 Transmitter Requirements

4.3.1 General

The transmitter requirements for EUT covered by the scope of the present document are justified in Table B.1.

4.3.2 Operating Frequency Range (OFR)

4.3.2.1 Applicability

The Operating Frequency Range (OFR) requirement applies to all LPR categories as specified in Table 3.

4.3.2.2 Description

The operating frequency range is described in ETSI EN 303 883-1 [1], clause 5.2. According to this description, a value of 20 dB shall be used for the parameter X.

4.3.2.3 Limits

The OFR (all frequencies between f_L and f_H) shall be within one of the permitted frequency ranges (see Table 4).

Table 4: Permitted frequency ranges for the different level probing radar (LPR) categories

Mode of operation	LPR category	Frequency range
Transmit and receive	LPR1, LPR2, LPR9, LPR10	6 GHz ≤ f ≤ 8,5 GHz
Transmit and receive	LPR3, LPR4, LPR11, LPR12	24,05 GHz ≤ f ≤ 26,5 GHz
Transmit and receive	LPR5, LPR6, LPR13, LPR14	57 GHz ≤ f ≤ 64 GHz
Transmit and receive	LPR7, LPR8, LPR15, LPR16	75 GHz ≤ f ≤ 85 GHz

NOTE: The permitted frequency ranges are based on ECC Decision (11)02 [i.3], Annex 1, Table 1.

4.3.2.4 Conformance

The conformance test for the OFR shall be as defined in clause 5.4.1 and shall be done under normal conditions as defined in clause 5.1.2.

4.3.3 Mean e.i.r.p. spectral density

4.3.3.1 Applicability

The mean e.i.r.p. spectral density requirement applies to all LPR categories as specified in Table 3.

4.3.3.2 Description

The mean e.i.r.p. spectral density is described in ETSI EN 303 883-1 [1], clause 5.3.2.

4.3.3.3 Limits

Within the OFR, the mean e.i.r.p. spectral density shall not exceed the limits in Table 5.

Table 5: Mean e.i.r.p. spectral density limits

LPR category	Maximum mean e.i.r.p. spectral density (within the antenna main beam)
LPR1, LPR2	-53 dBm/MHz
LPR9, LPR10	-33 dBm/MHz
LPR3, LPR4	-34 dBm/MHz
LPR11, LPR12	-14 dBm/MHz
LPR5, LPR6	-22 dBm/MHz
LPR13, LPR14	-2 dBm/MHz
LPR7, LPR8	-23 dBm/MHz
LPR15, LPR16	-3 dBm/MHz

4.3.3.4 Conformance

The conformance test for mean e.i.r.p. spectral density shall be as defined in clause 5.4.2 and shall be done under normal conditions as defined in clause 5.1.2.

4.3.4 Peak e.i.r.p. spectral density

4.3.4.1 Applicability

The peak e.i.r.p. spectral density requirement applies to all LPR categories as specified in Table 3.

4.3.4.2 Description

The peak e.i.r.p. spectral density is described in ETSI EN 303 883-1 [1], clause 5.3.4.1.

4.3.4.3 Limits

Within the OFR, the peak e.i.r.p. spectral density shall not exceed the limits in Table 6.

Table 6: Peak e.i.r.p. spectral density limits

LPR category	Maximum peak e.i.r.p. (measured in 50 MHz within the antenna main beam)
LPR1, LPR2	-13 dBm
LPR9, LPR10	7 dBm
LPR3, LPR4	6 dBm
LPR11, LPR12	26 dBm
LPR5, LPR6	15 dBm
LPR13, LPR14	35 dBm
LPR7, LPR8	14 dBm
LPR15, LPR16	34 dBm