UWB PRODUCT CERTIFICATION PROCESS IN EUROPE

How to take your Decawave DW1000 / DWM1000 based product through the European certification process

Version 1.0

This document is subject to change without notice

TABLE OF CONTENTS

1 INTRODUCTION 5

1.1 OVERVIEW 5
1.2 ABOUT THIS DOCUMENT 5

2 OVERVIEW OF THE CERTIFICATION PROCESS 6

2.1 INTRODUCTION 6
2.2 TESTS 6
2.2.1 Relevant tests 6
2.2.2 Conducted emissions tests 7
2.2.3 Commonly applicable radiated emissions tests 7
2.2.4 Commonly applied electromagnetic compatibility tests 7

3 GENERAL TEST SETUP 8

3.1 INTRODUCTION 8
3.2 EMISSIONS TESTS 8
3.2.1 Introduction 8
3.2.2 Intended emissions tests 8
3.2.3 Unintended emissions tests 9

4 THE REGULATORY REGIME IN EUROPE 10

4.1 INTRODUCTION 10
4.1.1 The European Union 10
4.1.2 CEPT / ECC / ETSI 10
4.2 RELEVANT REGULATIONS 11
4.2.1 Relevant EU Directives 11
4.2.2 CEPT's various decisions 11
4.2.3 ETSI Harmonised standards relevant to UWB 12
4.2.4 The EU's Radio & Telecommunications Terminal Equipment Directive 12
4.2.5 Compliance with section 3.1(a) of the R&TTE Directive 13
4.2.6 Compliance with section 3.1(b) of the R&TTE Directive 14
4.2.7 Compliance with section 3.2 of the R&TTE 14
4.2.8 Specific items of importance in the harmonised standards 16

5 THE CERTIFICATION PROCESS IN EUROPE 17

5.1 OVERVIEW OF THE PROCESS 17
5.2 DETAILS OF THE PROCESS 17
5.2.1 Identify the relevant directives and associated relevant standards 18
5.2.2 Determine whether you can self-certify or whether you must use a Notified Body 18
5.2.3 Verify that your product complies with the relevant directives 19
5.2.4 Compile the technical documentation 19
5.2.5 Issue the Declaration of Conformity 20
5.2.6 Apply the CE mark and any other relevant labels to the product 20
5.2.7 Ensure your product remains in compliance 21

6 GLOSSARY 22

7 REFERENCES 24

8 DOCUMENT HISTORY 27

9 MAJOR CHANGES 27

10 ABOUT DECAWAVE 27

11 APPENDIX 1: SPECIFIC MEASUREMENTS OF RELEVANCE TO DW1000 28

11.1 INTRODUCTION 28

11.2 MAXIMUM MEAN POWER SPECTRAL DENSITY 28
11.2.1 Definition 28
11.2.2 Measurement method 28
11.2.3 Measurement conditions 29
11.3 MAXIMUM PEAK POWER 30
11.3.1 Definition 30
11.3.2 Measurement method 30

12 APPENDIX 2: LIST OF NOTIFIED BODIES 31

12.1 INTRODUCTION 31
12.2 AMERICAS 31
12.3 APAC 31
12.3.1 China 31
12.3.2 Korea 32
12.3.3 Taiwan 32
12.4 EMEA 32

13 APPENDIX 3: EN 302 065 EMISSION LIMITS 34

13.1 EN 302 065-01: REQUIREMENTS FOR GENERIC UWB APPLICATIONS 34
13.1.1 Mean Power 34
13.1.2 Peak Power 34
13.2 EN 302 065-02: REQUIREMENTS FOR UWB LOCATION TRACKING 35
13.2.1 Classification of UWB systems for location tracking 35
13.2.2 Mean Power 35
13.2.3 Peak Power 37
13.3 EN 302 065-03: REQUIREMENTS FOR UWB DEVICES FOR ROAD & RAIL VEHICLES 38
13.3.1 Mean Power 38
13.3.2 Peak Power 39

14 APPENDIX 4: PRODUCT LABELLING AND MARKING 41

14.1 PRODUCT LABELLING REQUIREMENTS UNDER THE R&TTE DIRECTIVE 41
14.2 RECOGNISED EU COUNTRY CODES 44

15 APPENDIX 3: EXAMPLE DECLARATION OF CONFORMITY 45

LIST OF TABLES

TABLE 1: ORGANISATION OF THIS DOCUMENT 5
TABLE 2: RELEVANT EU DIRECTIVES 11
TABLE 3: RELEVANT CEPT / ECC DECISIONS 11
TABLE 4: RELEVANT ETSI GENERAL STANDARDS 12
TABLE 5: RELEVANT ETSI SPECIFIC STANDARDS 12
TABLE 6: SECTIONS OF THE R&TTE DIRECTIVE 12
TABLE 7: STANDARDS COVERING COMPLIANCE WITH SECTION 3.1(B) OF THE R&TTE DIRECTIVE 14
TABLE 8: CLASSIFICATION OF UWB SYSTEMS 14
TABLE 9: STANDARDS COVERING COMPLIANCE WITH SECTION 3.2 OF THE R&TTE DIRECTIVE 14
TABLE 10: LOW DUTY CYCLE SPECIFICATIONS 16
TABLE 11: OPTIONS OPEN IN THE EVENT OF NON-COMPLIANCE 19
TABLE 12: GLOSSARY OF TERMS & ABBREVIATIONS 22
TABLE 13: TABLE OF REFERENCES 24
TABLE 14: ETSI TR 102 495 PARTS 26
TABLE 15: DOCUMENT HISTORY 27
TABLE 16: CHANGE LOG REVISION 1.0 27
TABLE 17: MAXIMUM VALUE OF MEAN POWER SPECTRAL DENSITY LIMIT (E.I.R.P.) (CEPT REPORT 45) 34
TABLE 18: MAXIMUM PEAK POWER LIMIT 34
TABLE 19: CLASSIFICATION OF UWB SYSTEMS 35
TABLE 20: MAXIMUM VALUES OF MEAN POWER SPECTRAL DENSITY (E.I.R.P.) FOR LT1 EQUIPMENT 35

TABLE 21: MAXIMUM VALUES OF MEAN POWER SPECTRAL DENSITY FOR LT2 EQUIPMENT 36
TABLE 22: MAXIMUM VALUES OF MEAN POWER SPECTRAL DENSITY FOR LAES EQUIPMENT 36
TABLE 23: MAXIMUM PEAK POWER LIMIT FOR LT1 EQUIPMENT 37
TABLE 24: MAXIMUM PEAK POWER LIMIT FOR LT2 EQUIPMENT 37
TABLE 25: MAXIMUM PEAK POWER LIMIT FOR LAES EQUIPMENT 38
TABLE 26: MEAN POWER SPECTRAL DENSITY LIMIT 38
TABLE 27: MAXIMUM PEAK POWER LIMIT 39
TABLE 28: RECOGNISED EU COUNTRY CODES 44

LIST OF FIGURES

FIGURE 1: TYPICAL ANECHOIC CHAMBER 8
FIGURE 2: DIAGRAMMATICAL REPRESENTATION OF THE SECTIONS OF THE R&TTE DIRECTIVE 13
FIGURE 3: OVERVIEW CERTIFICATION PROCESS 18
FIGURE 4: CE MARK 20
FIGURE 5: MEASURING MAX MEAN PSD 28
FIGURE 6: PRINCIPLE OF THE REGULATIONS 38

1 INTRODUCTION

1.1 Overview

Product certification is concerned with ensuring that a product complies with all the relevant regulations and legislation that apply to it in a particular jurisdiction. UWB based products are required to seek certification in all of the jurisdictions the manufacturer wishes to sell them.

This document sets out to provide an overview of that portion of the certification process related to UWB under European regulations. However you should seek advice from a competent authority on the best approach to certifying your product for the particular markets of interest to you.

UWB regulations differ from jurisdiction to jurisdiction and while regulatory requirements are broadly similar in many regions of the world there is no global, harmonised certification process. Thus it is necessary to seek certification in each jurisdiction in which you wish to sell your product.

1.2 About this document

This document begins by outlining the concept of certification as is applies to electronic products in general and radio based products in particular. It goes on to discuss the certification process for UWB based products in Europe. Other documents in this APR series deal with other jurisdictions.

Appendices cover detailed technical aspects around setting up your product for certification testing with particular emphasis on radiated power measurements and peak power measurements – both of which are very relevant to meeting the various regulatory requirements.

This document is structured as follows: -

Table 1: Organisation of this document

Section	Title	Description
Section 1	This section	Introduction
Section 2	Outline of the certification process	Gives an outline of the certification process in general without reference to specific regional variations
Section 3	General test setup	Describes the test setup generally employed in certification testing, again without reference to specific regional variations
Section 4	Certification in Europe	Describes the certification process in Europe (those countries that are members of CEPT)
Appendix 1	Specific measurements of relevance to the DW1000	Describes a number of measurements used during the certification process that are relevant to the DW1000
Appendix 2	List of accredited test houses	Provides a list of test houses that are accredited to various regional regulatory bodies
Appendix 3	Emission Limits	Gives the current emission limits for UWB products under ETSI rules in force at the time of writing
Appendix 4	Product labelling and marking	Provides information on how products should be labelled indicating they conform to the regulations
Appendix 5	Draft Declaration of Conformity	Gives a template Declaration of Conformity that is required to be completed by a product manufacturer stating that its products conform with the requirements of the relevant directives

2 OVERVIEW OF THE CERTIFICATION PROCESS

2.1 Introduction

This section provides a general overview of the product certification process.

The process of "certification" involves testing a product in a defined way against regulatory limits defined by a nominated regulatory body in a particular jurisdiction. Usually, products may not be used, or may only be used under very specific circumstances, in a given jurisdiction unless they are certified under the regulations for that jurisdiction.

The rules for any particular jurisdiction are established by the regulatory body for that jurisdiction. The regulatory body sets out the rules which generally establish what tests should be carried out and what the test limits are for each test. Usually the regulatory body will qualify individual test houses (a process known as accreditation) in the jurisdiction and possibly in other jurisdictions also to carry out this testing.

A product developer wishing to launch a product to market that falls under the regulations must ensure that it meets the requirements of the relevant rules & regulations. Assuming the product meets those requirements (a process that involves testing of the products in different ways) it is deemed to meet the regulations and, once certain formalities are observed, is declared "certified" under the regulations.

Generally, when a product is certified there are certain requirements on the labelling that should appear on the product. Labelling a product to indicate that it is certified when in fact it is not is normally an offence which may result in a fine or prison term depending on the jurisdiction.

Most regions in the world certify products in generally the same way although the details of the applied tests and the allowed measurement limits for each of those tests may vary considerably between regions and between individual use cases.

There are a number of general areas that are tested during the certification process: -

- **Safety related tests:** these are tests to ensure the product, in the form in which it is intended to be sold, cannot cause injury to users; in the technology product area this usually relates to the risk of electrical shock but also includes issues such as chemical emissions and use of hazardous materials.
- **Conducted emissions tests:** these are tests related to emissions that are carried from the product down any cables or connections to the product. Of particular interest is the mains power cable if the product is intended to be mains powered.
- **Radiated emissions tests:** these are tests related to emissions radiated from the product. There are two sub-categories here: -
    - Intended emissions as in the case of a radio transmitter
    - Unintended emissions related to electromagnetic "noise" radiated from the product in normal operation.
- **Susceptibility to emissions tests:** these are tests designed to determine the products ability to function correctly and / or without damage in the presence of external electromagnetic fields.

2.2 Tests

2.2.1 Relevant tests

The certification tests that are relevant to a particular product depend on the type of product and its intended function. In some cases the same product could be certified under a number of different regulations depending on the use for which it is intended. It is important to seek guidance on this

matter so as to make the correct choice and avoid trying to certify a product under stringent regulations in one section of the regulatory code when it may be possible to certify it more easily under a different section of the regulatory code.

2.2.2 Conducted emissions tests

These tests focus on *unintended* emissions that are carried by any cables connected to the product under test. They apply to any cables that are intended to be attached to the product in normal operation.

In particular if the product is intended to be: -

- powered by an external power supply then the emissions that are conducted via the power supply cable are of interest.
- connected via a cable to any kind of communications network then the emissions that are conducted via the communications cable(s) are of interest.

In the context of UWB products conducted emissions tests will apply to anchor nodes in an RTLS that are powered from an external source or use Ethernet or some other cable-connected backhaul to the location engine.

2.2.3 Commonly applicable radiated emissions tests

As mentioned, there are two cases to consider here:

2.2.3.1 Intended radiated emissions

This is of clear interest in the case of products based on the DW1000 since it is a transceiver and can be configured as a transmitter.

In this case, regulatory bodies set limits on the allowable radiated power at any given frequency – we'll see more of this later.

2.2.3.2 Unintended radiated emissions

All electronic equipment generates a certain amount of "noise". Digital clocks and switching circuits, DC/DC converters and many other circuits generate switching transients that, if not handled properly by design and / or shielding, can generate sizeable spurious emissions from a product. Unintended emissions tests are designed to measure these emissions and ensure they are kept below defined limits to as to avoid interfering with the correct operation of other equipment and sensitive receivers intended to receive intentional emissions.

These emissions can be difficult to deal with if they are found to exist and may require shielding to prevent the emissions from the product or in an extreme case some level of circuit redesign to remove or alter the source of the emissions so that they meet the regulatory limits.

2.2.4 Commonly applied electromagnetic compatibility tests

These tests are designed to verify the correct operation of the product in the presence of external electromagnetic energy.

3 GENERAL TEST SETUP

3.1 Introduction

This section discusses the general setup used in the tests described in the previous section. Specific jurisdictional differences are noted in subsequent sections.

3.2 Emissions tests

3.2.1 Introduction

These tests involve placing the device under test (DUT) in what is known as an “anechoic chamber”. This chamber is designed to eliminate all external sources of EM radiation and also to eliminate all RF reflections within the chamber. This allows the directly transmitted signal from the DUT to be measured accurately.

An antenna in the chamber is connected via a port in the chamber to external measurement instruments so that emissions from the unit under test can be measured. The DUT is mounted on a turntable that allows it to be orientated at any angle to the test antenna. The test antenna can also be raised and lowered on its vertical axis.

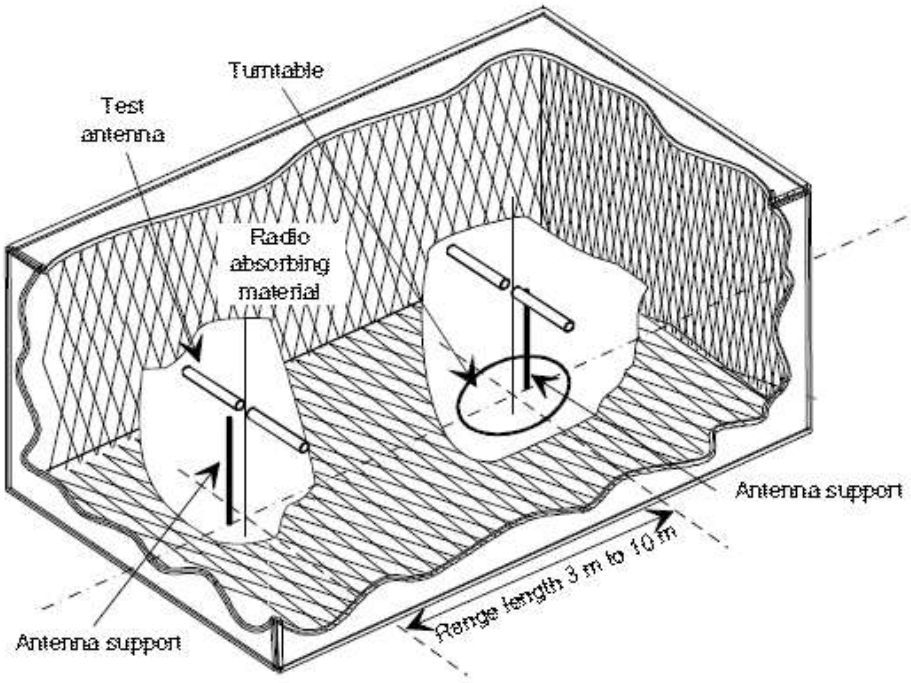

Figure 1: Typical anechoic chamber

The setup in the chamber is characterized and calibrated so that losses between the DUT and the antenna in the chamber, the gain / loss in the test antenna and any attenuation in the cables between the antenna and the external measurement instruments is known and can be used to correct the actual measurements

3.2.2 Intended emissions tests

For intended emissions tests the applicable regulations specify the maximum allowed radiated power level from the DUT over the frequency range of interest. For UWB devices this spans from 0 GHz to in excess of 10.5 GHz.

These emission limits vary across regulatory jurisdictions. They also vary for particular applications

and use cases so it is important to agree with the accredited test house for which use cases your product is being certified.

The measurement instrument, generally a spectrum analyser, is set up for the frequency span of interest, various other parameters are appropriately set and the DUT is configured to transmit at the maximum intended power level (generally -41.3 dBm / MHz in UWB applications). It is desirable to configure the DUT into back-to-back repeated frame mode because this allows the spectrum analyser capture the transmitted spectrum more quickly but if this is not possible the DUT should be configured for the fastest transmission repetition rate possible.

The test starts by measuring the radiated spectrum from the DUT with the DUT and the antenna in a specific orientation. The orientation of the DUT relative to the antenna is then changed by rotating the turntable and the measurement process is repeated. In this way the radiated maxima and minima from the DUT are determined. The maxima are then investigated further to see if they exceed the relevant regulatory limits.

For a UWB device, because the maximum allowed transmit power is so low (-41.3 dBm/MHz) it is desirable to ensure the radiated transmit power is as close to the maximum limit as possible to maximise communications range. This may require that the Tx power be tuned at the test house to ensure the product meets the regulatory limits – this tuned value is the one that will be required to be used in the final product to ensure compliance with the regulations.

3.2.3 Unintended emissions tests

These tests are carried out in the same way as the intended emissions tests but here the focus is on emissions outside the bands of intended operation of the device. The limits here are generally very low. Depending on your product design it may be necessary to implement RF shielding to prevent unintentional radiation.

4 THE REGULATORY REGIME IN EUROPE

4.1 Introduction

4.1.1 The European Union

In Europe, the European Commission (EC) issues directives on all matters relating to the affairs of the European Union. These directives are binding on member states and must be incorporated into the national law of each member state.

Certain products for sale in Europe must be marked with the CE mark indicating that they comply with all the directives relevant to that type of product. CE marking signifies that the product conforms with all EC directives that apply to it. A discussion of all the directives that may apply to your product to allow it to be CE marked is beyond the scope of this document – we will confine ourselves to those specifically directed at ultra-wideband devices. These include directives in relation to: -

- short range radio devices incorporating ultra wideband
- radio and telecommunications terminal equipment

These directives lead to national and international standards. ETSI is the body responsible for the publication of these pan-European, or harmonised, standards. Compliance with these standards is a guaranteed way of complying with the underlying directives. It may be possible to meet the requirements of the underlying directives without complying with these harmonised standards but it is difficult to prove such compliance. The standards developed by ETSI include defined test methodologies so that, once a product has been tested according to those methodologies and has met the requirements of the standard, it is guaranteed to meet the requirements of the underlying directives.

The following does not claim to be an exhaustive treatment of the existing regulations but is intended to give the reader a sound overview of the regulations that are relevant to UWB based products.

For a more detailed discussion of the relevant regulations and how they inter-relate see Ref [1].

4.1.2 CEPT / ECC / ETSI

The European Conference of Postal and Telecommunications Administrations (CEPT) was established on June 26, 1959, as a coordinating body for European state telecommunications and postal organizations. The acronym comes from the French version of its name Conférence Européenne des administrations des Postes et des Télécommunications.

Currently there are 48 members of CEPT as follows: -

Albania, Andorra, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, The former Yugoslav Republic of Macedonia, Malta, Moldova, Monaco, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, San Marino, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom and Vatican

The CEPT organisation has a number of sub-groups the most relevant of which, in the context of UWB regulations, is the Electronics Communication Committee (ECC), formed by the merger of ECTRA (responsible for general telecommunications matters) and ERC (responsible for radio-communications matters).

The ECC issues Decisions and Recommendations neither of which are legally binding on its members (as opposed to Directives from the European Commission which are binding on EU member states). Decisions are regulatory texts providing measures on significant harmonisation matters, which CEPT members are strongly urged to follow. ECC Decisions are not obligatory

legislative documents; however, they are normally implemented by many CEPT administrations.

CEPT was responsible for the creation of the European Telecommunications Standards Institute (ETSI) in 1988.

4.2 Relevant regulations

4.2.1 Relevant EU Directives

Table 2: Relevant EU directives

Number	Description
2014/702/EU	Amending the Decision 2007/131/EC on the harmonised use of the radio spectrum for equipment using UWB technology
2014/53/EU	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 – **Radio Equipment Directive replacing the R&TTE directive**
2014/35/EU	Harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits – **Low Voltage Directive**
2013/752/EU	Amending Decision 2006/771/EC on harmonisation of the radio spectrum for use by short-range devices and repealing
2011/829/EU	Amending Decision 2006/771/EC on the harmonisation of the radio spectrum for use by Short Range Devices (SRD)
2010/368/EU	Amending the Decision 2006/771/EC on harmonisation of the radio spectrum for use by SRDs
2009/381/EC	Amending Decision 2006/771/EC on harmonisation of the radio spectrum for use by SRDs
2009/343/EC	Amending the Decision 2007/131/EC on the harmonised use of the radio spectrum for equipment using UWB technology
2008/432/EC	Amending Decision 2006/771/EC on harmonisation of the radio spectrum for use by short-range devices
2007/131/EC	Allowing the use of the radio spectrum for equipment using **Ultra-wideband technology** in a harmonised manner in the community
2006/771/EC	Harmonisation of the radio spectrum for use by Short Range Devices
2006/95/EC	Harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits – **Low Voltage Directive**
1999/5/EC	On radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity – **Radio & Telecommunications Terminal Equipment Directive**

4.2.2 CEPT's various decisions

CEPT and the ECC have issued a number of decisions of direct relevance to the use of UWB

Table 3: Relevant CEPT / ECC decisions

Number	Description
ECC / DEC(12)03	The harmonised conditions for UWB applications on board aircraft
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

Number	Description
ECC / DEC(07)01	Building Material Analysis (BMA) devices using UWB technology
ECC / DEC(06)04	The harmonised conditions for devices using Ultra-wideband (UWB) technology in bands below 10.6 GHz

4.2.3 ETSI Harmonised standards relevant to UWB

4.2.3.1 General standards

Table 4: Relevant ETSI general standards

Number	Description
EN 302 065	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD) using Ultra Wide Band technology (UWB) for communications purposes
EN 301 489-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Electro-Magnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements.

4.2.3.2 Specific standards

Table 5: Relevant ETSI specific standards

Number	Description
EN 301 489-33	Electromagnetic compatibility and Radio spectrum Matters (ERM); Electro-Magnetic Compatibility (EMC) standard for radio equipment and services; Part 33: Specific conditions for Ultra Wide Band (UWB) communications devices
EN 302 500	Electromagnetic compatibility and Radio spectrum Matters (ERM);Short Range Devices (SRD) using Ultra WideBand (UWB) technology; Location Tracking equipment operating in the frequency range from 6 GHz to 8.5 GHz

4.2.4 The EU's Radio & Telecommunications Terminal Equipment Directive

NOTE: There is a new Radio Equipment Directive (2014/53/EU) coming into force in the EU. This repeals the existing R&TTE directive (1999/5/EC).

In the European Union, all products incorporating a radio must conform to the Radio and Telecommunications Terminal Equipment (R&TTE) Directive as issued by the European Commission. The essential requirements of this directive are as follows: -

Table 6: Sections of the R&TTE directive

Directive	Article	Description
R&TTE Directive Essential Requirements	3.3	Additional requirements where decided by the European Commission (rarely used)
	3.2	Effective use of spectrum and orbital resources
	3.1b	EMC
	3.1a	Health & Safety of the user and any other person, including

Directive	Article	Description
		the objectives with respect to safety requirements contained in the Low Voltage Directive (LVD) – Directive 2014/35/EU, but with no voltage limit applying.

This is represented diagrammatically in Figure 2.

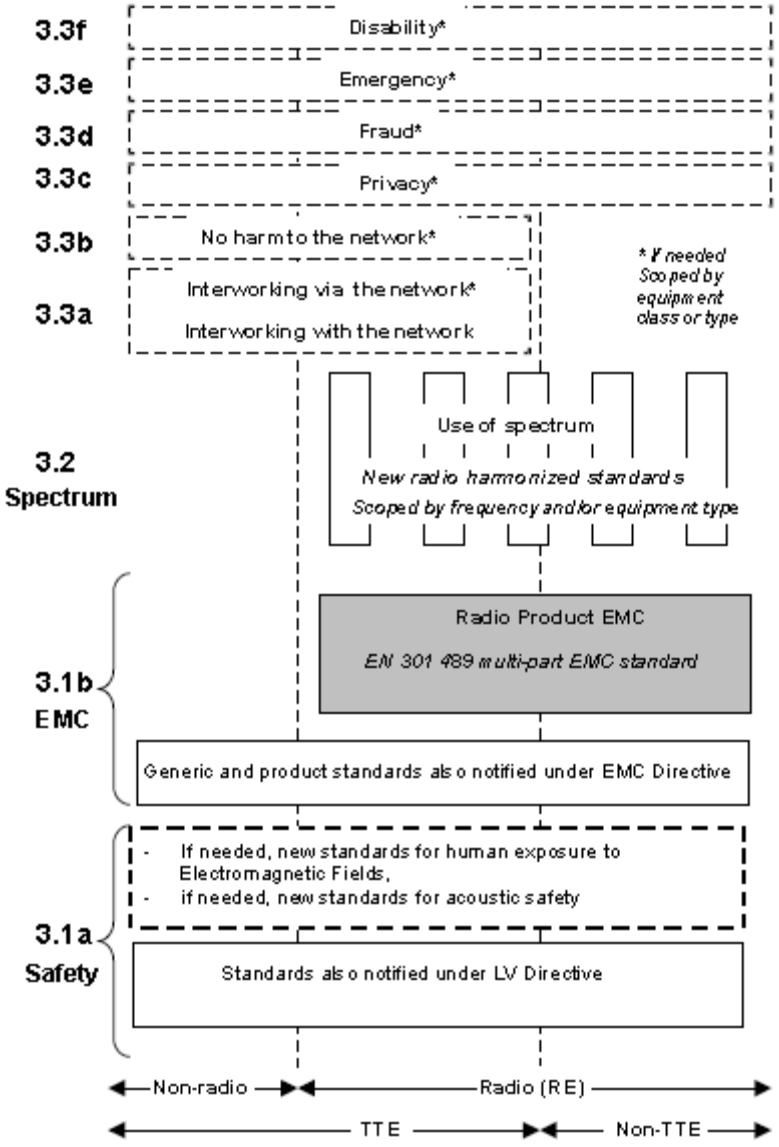

Figure 2: Diagrammatical representation of the sections of the R&TTE Directive

The easiest route to ensure compliance with the directive is to comply with the various "Harmonised Standards" issued by ETSI that deal with the various sections of the directive. Compliance with the relevant harmonised standards automatically ensures compliance with the R&TTE directive.

4.2.5 Compliance with section 3.1(a) of the R&TTE Directive

Article 3.1 (a) deals with matters relating to safety of the product.

This section includes the requirements of the Low Voltage Directive (LVD) but removes the voltage limit contained in the LVD which therefore means that battery-operated equipment such as GSM handsets and RTLS tags are also subject to this essential requirement.

This essential requirement covers all health and safety risks arising from the use of equipment, e.g. electrical, mechanical and chemical (e.g. emission of aggressive substances) as well as (but not exclusively) health aspects relating to noise, vibration and ergonomic aspects.

4.2.6 Compliance with section 3.1(b) of the R&TTE Directive

Article 3.1 (b) deals with the electromagnetic compatibility of the product.

ETSI EN 301 489 covers compliance of UWB systems with section 3.1(b) of the R&TTE directive.

Table 7: Standards covering compliance with section 3.1(b) of the R&TTE Directive

Harmonised EU standards covering essential requirements of section 3.1(b) of the R&TTE Directive	
ETSI EN 301 489-1	Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common Technical Requirements
ETSI EN 301 489-33	Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 33: Specific conditions for Ultra Wide Band (UWB) communications devices.

4.2.7 Compliance with section 3.2 of the R&TTE

Article 3.2 of the R&TTE directive deals with the efficient use of the radio spectrum.

There are a number of ETSI standards that cover compliance of UWB systems with section 3.2 of R&TTE directive as set out in the table below. The particular standard that applies depends on the classification of the UWB system. These classifications are as follows: -

Table 8: Classification of UWB systems

Classification	Description
Communications	Refers to transceivers, transmitters and receivers utilizing Ultra WideBand (UWB) technologies and used for short range communication purposes.
LT1	These systems, operating in the 6 GHz to 9 GHz region, are intended for general location tracking of people and objects. They operate on an unlicensed basis. The transmitting terminals in these systems are mobile (indoors or outdoors), or fixed (indoors only). Fixed outdoor LT1 transmitters are not permitted. Typically, LT1 transmitters are mobile location tracking tags which are attached to people or objects, and tags are tracked using a fixed receiver infrastructure to only receive the UWB emission emitted by the tags.
LT2	These systems, operating in the 3.1 GHz to 4.8 GHz region, are intended for person and object tracking and industrial applications at well-defined locations. The transmitting terminals in these systems may be located indoors or outdoors, and may be fixed or mobile. They operate at fixed sites and may be subject to registration and authorization, provided local coordination with possible interference victims has been performed.
LAES	These systems, operating in the 3.1 GHz to 4.8 GHz region, are intended for tracking staff belonging to the fire and other emergency services, who need to work in dangerous situations. Being able to track such people, even when deep inside a building, provides an important enhancement to command and control and to their personal safety. Typically, an LAES system is deployed temporarily at the scene of a fire or other emergency in a building. Licences may be required for user organization.

You need to decide into which classification your system / product incorporating the DW1000 falls so that the appropriate harmonized standards can be selected.

Table 9: Standards covering compliance with section 3.2 of the R&TTE Directive

UWB Application	Harmonised EU standards covering essential requirements of section 3.2 of the R&TTE Directive		Technical reports
Location Tracking Type 1 (LT1)	**ETSI EN 302-500-1**	Location tracking equipment operating in the frequency range from 6 to 9 GHz. Part 1: Technical characteristics and methods of measurement	**TR 102 495**: technical characteristics for SRD equipment using Ultra Wide Band technology (UWB): Part 3: Location tracking applications type 1 operating in the frequency band from 6 GHz to 8.5 GHz for indoor, portable and mobile outdoor applications.
	ETSI EN 302-500-1	Location tracking equipment operating in the frequency range from 6 GHz to 9 GHz. Part 2: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive.	
	ETSI EN 302 065-2	Short range devices (SRD) using Ultra wideband technology (UWB) for communications purposes; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 2: Requirements for UWB location tracking	
Location Tracking Type 2 (LT2)	**ETSI EN 302 065-2**	Short range devices (SRD) using Ultra wideband technology (UWB) for communications purposes; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 2: Requirements for UWB location tracking	**TR 102 495**: technical characteristics for SRD equipment using Ultra Wide Band technology (UWB): Part 5: Location tracking applications type 2 operating in the frequency bands from 3,4 GHz to 4,8 GHz and from 6 GHz to 8,5 GHz for person and object tracking and industrial applications
Location Tracking for Emergency Services (LAES)	**ETSI EN 302 065-2**	Short range devices (SRD) using Ultra wideband technology (UWB) for communications purposes; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 2: Requirements for UWB location tracking	**TR 102 496** System Reference document; Short Range Devices (SRD); Technical characteristics for Location tracking Applications for Emergency Services (LAES) in disaster situations operating within the frequency range from 3.4 GHz to 4.8 GHz
Location Tracking for Traffic Applications (LTT)	Draft EN in development. See **TR 102 495-7 section 9**		**TR 102 495**: technical characteristics for SRD equipment using Ultra Wide Band technology (UWB): Part 7: Location tracking & sensor applications for automotive and transportation environments operating in the frequency bands from 3.1 GHz to 4.8 GHz and 6 GHz to 8.5 GHz..
Category A: Location tracking in public transportation (road & rail vehicles) environment			
Category B: Location tracking and positioning in the automotive environment			
Category C: Sensing in the Automotive environment			
Generic UWB / UWB for Communications	**ETSI EN 302 065-1**	Short range devices (SRD) using Ultra wideband technology (UWB) for communications purposes; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 1: Common technical requirements	
	ETSI EN 302 065-2	Short range devices (SRD) using Ultra wideband technology (UWB) for communications purposes; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 2: Requirements for UWB location tracking	
	ETSI EN 302 065-3	Short range devices (SRD) using Ultra wideband technology (UWB) for communications purposes; Harmonized	**TR 103 086** Electromagnetic Compatibility and Radio Spectrum Matters (ERM);

UWB Application	Harmonised EU standards covering essential requirements of section 3.2 of the R&TTE Directive		Technical reports
		EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 3: Requirements for UWB devices for road and rail vehicles.	Short Range Devices (SRD; Conformance test procedure for the exterior limit tests in EN302 065-3 UWB applications in the ground based vehicle environment.

4.2.8 Specific items of importance in the harmonised standards

4.2.8.1 Interference mitigation techniques

The harmonized standards make reference to a number of what are referred to as interference mitigation techniques. These relate to the operation of a UWB transmitter and are an attempt to minimize any potential interference caused by that transmitter to other transmitters in range.

4.2.8.1.1 Low Duty Cycle

Low Duty Cycle (LDC) as it name implies is an attempt to minimize potential interference by a UWB transmitter by limiting the amount of time for which any particular transmitter may transmit. The specifications for LDC operation are defined in ECC / DEC(06)04 as follows: -

Table 10: Low Duty Cycle specifications

Parameter		Limit
Maximum transmitter on time	Ton max	5 ms
Mean transmitter off time	Toff mean	≥ 38 ms (averaged over 1 s)
Sum transmitter off time	Σ Toff	> 950 ms per second
Sum transmitter on time	Σ Ton	< 18 s per hour

These limits are modified in ETSI EN 302 065-02 in relation to LT2 and LAES equipment.

4.2.8.1.2 Detect and Avoid

Detect and Avoid (DAA) is an interference mitigation technique, specified in ETSI TS 102 754, in which a transmitter intending to transmit must listen to the channel on which it intends to transmit prior to doing so to determine whether any other transmitter is currently occupying that channel.

The detection scheme described in TS 102 754 allows for three different modes: -

- Direct measurement by the UWB transmitting device of the signal level in the intended channel.
- Information on victim services in the intended channel provided to the UWB transmitting device from an external central source.
- A combination of both of the above.

The actions that are permitted if an occupying signal is detected are laid out in TS 102 754.

5 THE CERTIFICATION PROCESS IN EUROPE

5.1 Overview of the process

The process in the European Union is one of **SELF-CERTIFICATION**. Under this process you must: -

- Identify the directives and associated standards that are relevant to your particular product
- Design the product to comply with those relevant standards
- Test the product or have the product tested by a suitably qualified test house to determine if, in fact, it does meet the regulations
- Assuming it does, or is modified to ensure it does, you create a technical file explaining the product in detail
- Issue a *Declaration of Conformity* signed by an officer of the company stating that the product is in compliance with the regulations listed in that declaration
- Affix the relevant markings to the product to indicate that it is in compliance with the standards
- Monitor production on a regular basis to ensure the product remains compliant with the standards

So, clearly the onus is on you, the product manufacturer, to show that the product design complies with the regulations and that a system is in place to ensure the product remains in compliance.

There are penalties associated with declaring compliance when the product does not comply or moves out of compliance over time – each product to which the relevant markings are attached must comply with the regulations.

5.2 Details of the process

The certification process is outlined in Figure 3 below.

Each of the stages is outlined in more detail in the sections that follow.

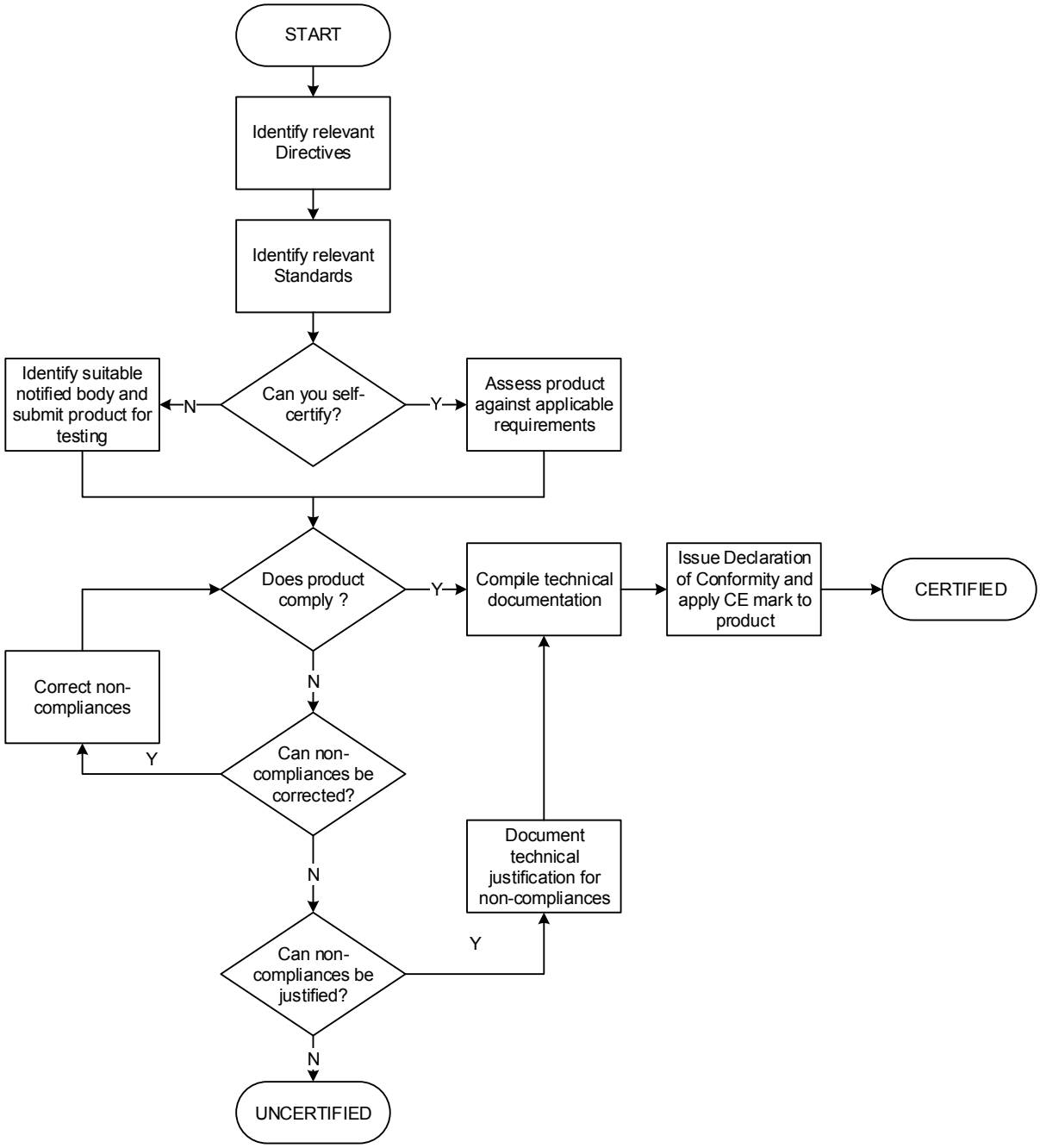

Figure 3: Overview certification process

5.2.1 Identify the relevant directives and associated relevant standards

You need to identify the directives that are appropriate to your product. In the context of a UWB product these will definitely include the R&TTE directive and the directive relating to the use of UWB but may include other directives depending on your particular product.

5.2.2 Determine whether you can self-certify or whether you must use a Notified Body

Before proceeding with the assessment procedure, it is important to determine whether you, the manufacturer, can assess your product by yourself or whether you have to involve a Notified Body. Depending on the type of apparatus and whether or not harmonised standards are used the R&TTE directive allows different possibilities of assessment procedures.

When you do not use Harmonised Standards, or when these do not exist, you must present your technical file (See section 5.2.4 below) to a Notified Body, which will review it.

In the case of UWB products: -

- If you intend certifying according to the various harmonised (EN) standards you do not need the review of a Notified Body and may do this yourself or organise to have it done on your behalf, provided you test your product in accordance with the test methods set out or referred to in those EN standards.
- If you intend certifying in accordance with the requirements of the underlying directives and **do not intend** using the EN harmonised standards then you will need to submit your product to a Notified Body which will assess your product against the requirements of the relevant directives. If the notified body deems the product to be in compliance with the underlying directives it will issue a Certificate of Conformity. This will allow you to issue your own Declaration of Conformity and affix the CE mark to your product. You will also need to affix the number of the notified body as per section 14.

A list of Notified Bodies is maintained by the EC http://ec.europa.eu/enterprise/newapproach/nando/

5.2.3 Verify that your product complies with the relevant directives

If you are using the services of a notified body they will assess whether your product complies with the requirements of the relevant directives. If you are testing in accordance with EN harmonised standards then you must have your product tested (or test it yourself if you have the necessary equipment) to ensure it meets the requirements laid out in those harmonised standards.

There are two possible outcomes here. Either your product: -

- Complies with the requirements of the relevant directives as determined by: -
    - A Notified Body which has examined your technical file and issued its opinion
    - Passing all the tests laid out in the appropriate EN standards and therefore complies with the requirements set out in the relevant directives
- Does not comply with the requirements set out in the directives / standards

If your product complies then you can proceed as per 5.2.4 below. If the product does not comply then there are a number of possible options open to you: -

Table 11: Options open in the event of non-compliance

Option	Question	Action
1	Can the non-compliances be corrected?	If the non-compliances can be corrected by some kind of product modification or update then you can make those modifications and re-test the product to verify compliance.
2	Can the non-compliances be justified?	If the non-compliances cannot be corrected but you feel they can be justified then you will need to make a case for their justification to the Notified Body who may decide your justifications are valid and will issue their opinion appropriately.

5.2.4 Compile the technical documentation

The product manufacturer must compile a technical file. This file should contain at least the following elements: -

a) A general description of the radio equipment including:
   i. photographs or illustrations showing external features, marking and internal layout;
   ii. versions of software or firmware affecting compliance with essential requirements;
   iii. user information and installation instructions;
b) Conceptual design and manufacturing drawings and schemes of components, sub-assemblies, circuits and other relevant similar elements;
c) Descriptions and explanations necessary for the understanding of those drawings and schemes and the operation of the radio equipment;
d) A list of the harmonised standards applied in full or in part the references of which have been published in the Official Journal of the European Union, and, where those harmonised standards have not been applied, descriptions of the solutions adopted to meet the essential requirements set out in Article 3, including a list of other relevant technical specifications applied. In the event of partly applied harmonised standards, the technical documentation shall specify the parts which have been applied;
e) A copy of the EU declaration of conformity (see section 15 for an example);
f) Where the conformity assessment module in Annex III has been applied, copy of the EU-type examination certificate and its annexes as delivered by the notified body involved;
g) Results of design calculations made, examinations carried out, and other relevant similar elements;
h) Test reports;
i) An explanation of the compliance with the requirement of Article 10(2) and of the inclusion or not of information on the packaging in accordance with Article 10(10).

You, the product manufacturer, are required to maintain this file for a period of 10 years after the radio equipment has been placed on the market.

5.2.5 Issue the Declaration of Conformity

You, the product manufacturer, must issue a Declaration of Conformity (see section 15 for an example). This declaration is binding on the manufacturer and states that the product identified in the declaration complies with the requirements of the directives stated in the declaration. This applies to each unit of a particular product.

You must keep the EU declaration of conformity for a period of 10 years after the radio equipment has been placed on the market.

5.2.6 Apply the CE mark and any other relevant labels to the product

The product manufacturer must affix the CE mark and any other required labels to the product.

Figure 4: CE mark

The penalties for incorrectly CE marking a product, falsely CE marking a product or failing to CE mark a product for which it is required are in the region of a maximum of 3 months in jail and a €10,000 fine (for the director of the offending company) but vary from member state to member state within the EC.

If a product is found not to be in compliance with the directives / standards as stated in its declaration of conformity then products may be withdrawn or recalled from the market. However, if the product is not regarded as an imminent safety risk, you may be given the opportunity to bring the product into compliance with the applicable legislation rather than being obliged to take the product off the market.

5.2.7 Ensure your product remains in compliance

You must ensure that as you manufacture units of your product they remain in compliance with the various directives / harmonised standards against which that particular product type was originally certified.

Affixing the CE mark to a particular unit of a product indicates that that particular unit is in accordance with the Declaration of Conformity – if it is found not to be so then the penalties mentioned in the previous section may equally apply as if you had fraudulently attached the CE mark in the first place.

You need to implement sufficient manufacturing and production controls to ensure that each unit of the product remains in compliance. If you make modifications to the product at any time during its life and those modification are such as to raise any doubts over its continued compliance with the regulations then re-testing may be required.

6 GLOSSARY

Table 12: Glossary of terms & abbreviations

Acronym	Full Name	Explanation
CEPT	European Conference of Postal and Telecommunications Administrations	Established in 1959 by 19 countries, which expanded to 26 during its first ten years. Original members were the monopoly-holding postal and telecommunications administrations. CEPT's activities included co-operation on commercial, operational, regulatory and technical standardisation issues. Today 48 countries are members of CEPT
CISPR	Comité International Spécial des Perturbations Radioélectriques or in English the International special committee on Radio Interference	A special committee under the sponsorship of the International Electrotechnical Commission (IEC). The membership is from national committees of the IEC, and other international organizations interested in the reduction of radio interference. CISPR was founded in 1934.
DAA	Detect & Avoid	An interference mitigation strategy where the device intending to transmit must first listen to the channel on which it intends to transmit for the presence of any existing communications and take the prescribed avoiding action if it detects such transmissions.
DUT / EUT / UUT	Device / Equipment / Unit under test	Used to denote the unit or product being tested.
EC	European Commission	The European Commission is one of the main institutions of the European Union. It represents and upholds the interests of the EU as a whole. It drafts proposals for new European laws. It manages the day-to-day business of implementing EU policies and spending EU funds.
ECC	Electronic Communications Committee	The ECC considers and develops policies on electronic communications activities in European context, taking account of European and international legislations and regulations. The ECC was established in September 2001 as a result of the merger between ECTRA (responsible for general telecommunications matters) and ERC (responsible for radio-communications matters).
ERC	Electronic Radio communications Committee	Forerunner to the ECC and incorporated into the ECC when that body was created in September 2001 by the merger of ECTRA and ERC
ETSI	European Telecommunications Standards Institute	Produces globally-applicable standards for Information and Communications Technologies (ICT), including fixed, mobile, radio, converged, broadcast and Internet technologies.
LAES	Location Tracking Application for Emergency Services	Particular class of location systems covered by EN 302 065-02 intended for use by emergency services and first responders to emergency situations in which increased levels of transmit power are permitted.
LDC	Low Duty Cycle	An interference mitigation strategy where a transmitter is allowed to transmit only for a limited

Acronym	Full Name	Explanation
		amount of time in any second / hour.
LT1	Location tracking system type 1	Particular class of location systems covered by EN 302 065-02
LT2	Location tracking system type 2	Particular class of location systems covered by EN 302 065-02
LVD	Low Voltage Directive	Directive 2014-35-EU of the European Parliament and of the Council of 26th February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.
NB	Notified Body	Certification, inspection or testing body designated by the Notifying authority of a EU Member State to perform the Attestation of Conformity of products within the scope of a New Approach Directive. With regard to the CPD, the minimum requirements for the bodies to be notified are laid down in Annex IV of the CPD. Member States may add requirements for the bodies they notify. Additional requirements can be accreditation, participation in European co-operation, restrictions on subcontracting etc.
R&TTE	Radio & Telecommunications Terminal Equipment Directive	Directive 1999-5-EC of the European Parliament and of the council of 9th March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.
RED	Radio Equipment Directive	Directive 2014-53-EU of the European Parliament and of the Council of 16th 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
SRD	Short Range Device	The term “Short Range Device” (SRD) is intended to cover radio transmitters which provide either unidirectional or bidirectional communication and which have low capability of causing interference to other radio equipment. SRDs use either integral, dedicated or external antennas and all modes of modulation can be permitted subject to relevant standards. SRDs are not considered a “Radio Service” under the ITU Radio Regulations (Article 1)
UWB	Ultra Wideband	A method of radio transmission where the minimum bandwidth of the transmitted signal is 500 MHz

7 REFERENCES

Reference is made to the following documents in the course of this Application Note: -

Table 13: Table of References

Ref	Doc Number / Title	Date	Version	Description
[1]	APR001		Current	APR001 UWB regulations - A summary of worldwide telecommunications regulations governing the use of Ultra Wideband
[2]	DW1000 Data Sheet		Current	DW1000 Data Sheet
[3]	DW1000 User Manual		Current	DW1000 User Manual
[4]	CEPT ECC Decision (06)04	09/12/11		ECC decision governing the harmonised conditions for devices using Ultra-Wideband (UWB) technology in bands below 10.6 GHz approved 24th March 2006 amended 6th July 2007 amended 9th December 2011
[5]	CEPT ECC Decision (12)03	02/11/12		ECC decision governing the harmonised conditions for UWB applications on-board aircraft
[6]	CEPT ERC Recommendation 70-03	07/02/14		This Recommendation sets out the general position on common spectrum allocations for Short Range Devices (SRDs) for countries within the CEPT. It is also intended that it can be used as a reference document by the CEPT member countries when preparing their national regulations in order to keep in line with the provisions of the R&TTE Directive.
[7]	ETSI EN 301 489-1	08/2002	V1.4.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Electro-Magnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements.
[8]	ETSI EN 301 489-33	12/2008	V1.1.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Electro-Magnetic Compatibility (EMC) standard for radio equipment and services; Part 33: Specific conditions for Ultra Wide Band (UWB) communications devices.
[9]	ETSI EN 302 065-01	15/04/14	V1.3.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD) using Ultra Wide Band technology (UWB) for communications purposes; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 1: Common technical requirements.
[10]	ETSI EN 302 065-02	15/04/14	V1.1.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD) using Ultra Wide Band technology (UWB) for communications purposes; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 2: Requirements for UWB location tracking.
[11]	ETSI	15/04/14	V1.1.1	Electromagnetic compatibility and Radio spectrum

Ref	Doc Number / Title	Date	Version	Description
	EN 302 065-03			Matters (ERM); Short Range Devices (SRD) using Ultra Wide Band technology (UWB) for communications purposes; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Requirements for UWB devices for road and rail vehicles.
[12]	ETSI EN 302 500-01	10/2010	V2.2.2	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD) using Ultra WideBand (UWB) technology; Location Tracking equipment operating in the frequency range from 6 GHz to 9 GHz; Part 1: Technical characteristics and methods of measurement.
[13]	ETSI EN 302 500-02	01/2010	V2.1.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD) using Ultra WideBand (UWB) technology; Location Tracking equipment operating in the frequency range from 6 GHz to 9 GHz; Part 2: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive.
[14]	ETSI TR 102 495	See below	See below	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Technical characteristics for SRD equipment using Ultra Wide Band Sensor technology (UWB); System Reference Document. A multipart document dealing with aspects of UWB based SRDs – see Table 14 below for further details.
[15]	ETSI TR 102 496	06/2005	V1.1.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Technical characteristics for indoor Location Application for Emergency Services (LAES) in disaster situations operating within the frequency range from 3 GHz to 5 GHz; System Reference Document.
[16]	ETSI TR 103 086	03/2013	V1.1.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Conformance test procedure for the exterior limit tests in EN 302065-3 UWB applications in the ground based vehicle environment.
[17]	ETSI TS 102 754	03/2013	V1.3.1	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.
[18]	ETSI TS 102 883	08/2012	V1.1.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD) using Ultra Wide Band (UWB); Measurement Techniques
[19]	EU Commission Directive 1999-5-EC (R&TTE)	09/03/99		Directive 1999-5-EC of the European Parliament and of the council of 9th March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.
[20]	EU Commission Directive 2014-53-EU (RED)	16/04/14		Directive 2014-53-EU of the European Parliament and of the Council of 16th April 2014 on the harmonisation of the laws of the Member States

Ref	Doc Number / Title	Date	Version	Description
				relating to the making available on the market of radio equipment and repealing Directive 1999-5-EC.
[21]	EU Commission Directive 2014-35-EU amend 2006-95-EC LVD	26/02/14		Directive 2014-35-EU of the European Parliament and of the Council of 26th February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.
[22]	EU Commission Directive 2014-702-EU	07/10/14		Commission Implementing Decision of 7th October 2014 amending Decision 2007-131-EC on allowing the use of the radio spectrum for equipment using ultra-wideband technology in a harmonised manner in the Community.

Table 14: ETSI TR 102 495 parts

Ref	Part	Description
[14.1]	Part 1	Building material analysis and classification applications operating in the frequency band from 2.2 GHz to 8 GHz.
[14.2]	Part 2	Object Discrimination and Characterization (ODC) applications operating in the frequency band from 2.2 GHz to 8.5 GHz.
[14.3]	Part 3	Location tracking applications type 1 operating in the frequency band from 6 GHz to 8.5 GHz for indoor, portable and mobile outdoor applications.
[14.4]	Part 4	Object identification for surveillance applications operating in the frequency band from 2.2 GHz to 8 GHz.
[14.5]	Part 5	Location tracking applications type 2 operating in the frequency bands from 3.4 GHz to 4.8 GHz and from 6 GHz to 8.5 GHz for personnel tracking and industrial applications.
[14.6]	Part 6	Object Detection for industrial Mobile, construction, agriculture and other off-road applications operating in the frequency band from 6 GHz to 7.25 GHz (ODM).
[14.7]	Part 7	Location tracking and sensor applications for automotive and transportation environments operating in the frequency band from 3.1 GHz to 4.8 GHz and 6 GHz to 9 GHz.

8 DOCUMENT HISTORY

Table 15: Document History

Revision	Date	Description
1.0	21st April, 2015	Initial release

9 MAJOR CHANGES

Table 16: Change log revision 1.0

Page	Change Description
All	Initial release

10 ABOUT DECAWAVE

DecaWave is a pioneering fabless semiconductor company whose flagship product, the DW1000, is a complete, single chip CMOS Ultra-Wideband IC based on the IEEE 802.15.4-2011 UWB standard. This device is the first in a family of parts that will operate at data rates of 110 kbps, 850 kbps and 6.8 Mbps.

The resulting silicon has a wide range of standards-based applications for both Real Time Location Systems (RTLS) and Ultra Low Power Wireless Transceivers in areas as diverse as manufacturing, healthcare, lighting, security, transport, inventory & supply chain management.

Further Information

For further information on this or any other DecaWave product contact a sales representative as follows: -

DecaWave Ltd
Adelaide Chambers
Peter Street
Dublin 8
t: +353 1 697 5030
e: sales@decawave.com
w: www.decawave.com

11 APPENDIX 1: SPECIFIC MEASUREMENTS OF RELEVANCE TO DW1000

11.1 Introduction

This section details two specific measurements that will be required with your DW1000 based product. Specifically these are: -

- Maximum mean power spectral density
- Maximum peak power

The approved measurement methods required to ensure compliance with the EN 302 065 suite of harmonised standards are specified in **TS 102 883** and you should refer to this document for details of how to make all relevant measurements required including the two listed above.

11.2 Maximum mean power spectral density

11.2.1 Definition

The maximum mean power spectral density (specified as e.i.r.p.) of the radio device under test, at a particular frequency, is the average power per unit bandwidth (centred on that frequency) radiated in the direction of the maximum level under the specified conditions of measurement.

This measurement verifies that at no frequency is there a transmitted signal with an average power that exceeds the spectrum mask limit of relevance in your jurisdiction.

11.2.2 Measurement method

The following is a typical measurement method employing a calibrated test setup. Other methods are permissible also. You should contact your local test house for further information.

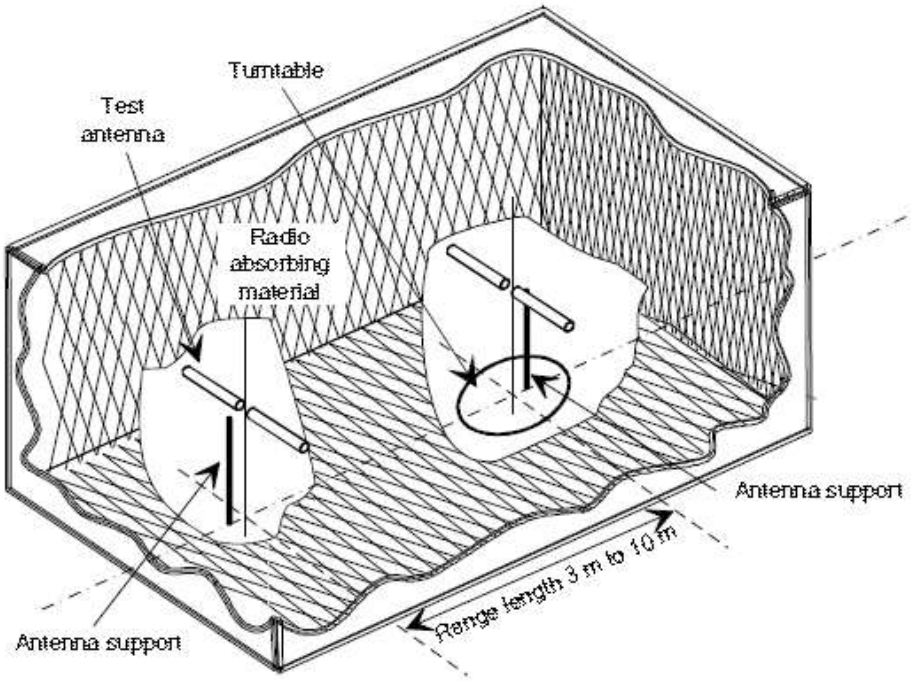

Figure 5: Measuring max mean PSD

In a calibrated test setup, the measurement receiver, test antenna and all associated equipment (e.g. cables, filters, amplifiers, etc.) will have been recently calibrated against known standards at all the frequencies on which measurements of the equipment under test (EUT) are to be made.

The EUT is placed at the specified height on a support, and in the position closest to normal intended use.

Note that because UWB signals are transmitted at a very low level it is permitted to use a 1 m separation between the DUT and the test antenna when making measurements.

The test antenna is chosen to match the channel frequency of the unit under test and is initially oriented for vertical polarization.

The output of the test antenna is connected to the spectrum analyser via whatever (fully characterized) equipment is required so that the signal is measurable (e.g. amplifiers).

The EUT is switched on, if possible without modulation although operation with modulation is acceptable, and the spectrum analyser is tuned to the channel centre frequency of the EUT.

The test antenna is raised and lowered through the specified range of height until a maximum signal level is detected by the spectrum analyser.

The EUT is then rotated through 360° in the horizontal plane, until the maximum signal level is detected by the spectrum analyser.

The test antenna is then raised and lowered again through the specified range of height until a maximum signal level is detected by the spectrum analyser.

The maximum signal level detected by the spectrum analyser is noted and converted into radiated power by using the pre-determined calibration coefficients for the measurement equipment being used.

The test is repeated for horizontal polarization of the test antenna.

Many test houses use an automated process to drive the antenna raising / lowering device, the turntable and the spectrum analyser so that the entire process, once configured, is carried out without operator intervention.

11.2.3 Measurement conditions

ETSI measurement conditions are specified as follows: -

Measurements should be carried out over the frequency range from 30 MHz to 18 GHz, as shown in the relevant harmonized standards, and should be applied to all combination(s) of the radio device and its intended antenna(s).

Where the RF power level is user adjustable, all measurements shall be made with the highest power level available to the user for each radio device / antenna combination. For a UWB tag, for example, it is most likely that the antenna will be integrated into the tag and the power level will be fixed at manufacturing time so only one measurement configuration is required.

When measuring maximum mean power spectral density from the EUT, the spectrum analyser or equivalent should be configured as follows unless otherwise stated:

Parameter	Value
Resolution bandwidth	1 MHz
Video bandwidth	Not less than the resolution bandwidth
Detector mode	RMS (power average)
Display Mode	Max. hold
Average time	1 ms or less (per sweep point on spectrum analyser scan)

Parameter	Value
Note: "Average time" may not be an explicit setting. In some cases it may be determined by setting the number of measurement points and the time taken for a sweep.	
Frequency Span	Equal to or less than the number of sweep points multiplied by the resolution bandwidth, preferably less than half as much.

11.3 Maximum peak power

11.3.1 Definition

The maximum peak power specified as e.i.r.p. contained within a 50 MHz bandwidth at the frequency at which the highest mean radiated power occurs, radiated in the direction of the maximum level under the specified conditions of measurement.

This measurement verifies that at no frequency is there a transmitted signal with a peak power that exceeds the spectrum mask limit of relevance in your jurisdiction.

11.3.2 Measurement method

For all UWB modulations the maximum peak power (e.i.r.p.) shall be measured at the frequency of the maximum mean power spectral density as recorded under section 11.2

Measurements shall be carried out over the frequency range from 30 MHz to 18 GHz.

When measuring maximum peak power from the EUT, the spectrum analyser used should be configured as follows:

Parameter	Value
Resolution bandwidth	50 MHz
Note: Using a lower resolution bandwidth will lead to an overestimation of the peak power. Some jurisdictions allow the use of a lower resolution bandwidth with a correction factor defined as 20*log(50 MHz / actual resolution bandwidth) applied to the measurement result to give the peak power. **This method will cause the DW1000 to fail in certain use cases and depending on the Resolution Bandwidth used. To avoid this issue, a 50 MHz RBW instrument should always be used.**	
Video bandwidth	Not less than the resolution bandwidth
Detector mode	Peak
Display Mode	Max. hold
Measurements shall be continued with the transmitter emitting the normal test signal (see clause 5.2) until the displayed trace no longer changes	

12 APPENDIX 2: LIST OF NOTIFIED BODIES

12.1 Introduction

For a current complete list of Notified Bodies refer to the European Commission's NANDO database

This section lists accredited test houses that can be used to verify your DW1000 based product against local, regional and in some cases global regulations. Contact the test house in your area for more information.

12.2 Americas

Compliance Testing LLC
Address: Arizona
Email: Info@ComplianceTesting.com
Toll Free - 866-311-3268
AZ - Local - 480-926-3100
Fax - 480-926-3598

Compliance Worldwide
357 Main Street
Sandown, NH 03873
(603) 887 3903 Fax 887-6445
www.complianceworldwide.com

D.L.S. Electronic Systems, Inc.

Headquarters Address:
1250 Peterson Dr.
Wheeling, IL 60090
USA

Phone: 847-537-6400
Fax: 847-537-6488
Web: http://www.dlsemc.com

OATS Address:
166 South Carter
Genoa City, WI 53128
USA

Phone: 262-279-0210

MiCOM LABS
575 Boulder Court
Pleasanton, California 94566
USA
Tel: (+1) 925 462 0304

TDK Test Systems
Attn: Armando Medina
1101 Cypress Creek Road
Cedar Park, TX 78613
Tel: +1-512-258-9478
Web: http://www.tdkrfsolutions.com

12.3 APAC

12.3.1 China

CCS
China

Address: Various
http://www.ccsrf.com

Telecommunication Metrology Center of MIIT
Xiaochen Chen
Telecommunication Metrology Center of MIIT NO. 52,
Huayuan Bei Road,
Haidian District,
Beijing, China, 100083

Office: +86 10 62304633-2061
Fax: +86 10 62304633-2063
Mobile: +86 138 1182 7382
Skype: china-chenxiaochen
e-mail: chenxiaochen@emcite.com or chenxiaochen@catr.cn
Web: http://www.emcite.com

Shenzhen NTEK Testing Technology Co.,Ltd.
Address: Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China

Tel：（0755）61156588
Fax：（0755）61156599
Web：www.ntek.org.cn
e-mail：ntek@ntek.org.cn

Customer service Line：
Service Department： （0755）61156516
EMC Department： （0755）61156511
Safety Department （UL Special line）： （0755）61156533
Battery Department： （0755）61156568
CCC Special line ： （0755）61156595
PV & CTA： （0755）61156566
Customer complaint： （0755）61156555

12.3.2 Korea

Telecommunications Technology Association (TTA)
Atten: Dongho Kim
267-2 Seohyeon-dong, Bundang-gu,
Seongnam-city,
Gyeonggi-do, 463-824, Korea
Fax: +82-31-724-0026
Mobile: +82-10-5111-1038, +82-10-3317-8307,
e-mail: kim@tta.or.kr,
Web: http://www.tta.or.kr/English/

12.3.3 Taiwan

CCS
Taiwan
Address: Various
http://www.ccsrf.com

12.4 EMEA

CETECOM GmbH
Im Teelbruch 116
45219 Essen,
Germany

Phone: +49 (0) 20 54 / 95 19-0
Fax: +49 (0) 20 54 / 95 19-997
info@cetecom.com

EMCC DR. RAŠEK
Moggast, Boelwiese 4-8
91320 Ebermannstadt
Germany

Tel: + 49 9194 9016
Fax: + 49 9194 8125
e-mail: emc.cons@emcc.de
Web: http://www.emcc.de

TÜV Product Service Ltd
TÜV SÜD Group
Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire PO15 5RL
United Kingdom

Tel: +44 (0)1489 558100
Fax: +44 (0)1489 558101
e-mail: info@tuvps.co.uk
web: www.tuvps.co.uk

13 APPENDIX 3: EN 302 065 EMISSION LIMITS

13.1 EN 302 065-01: Requirements for generic UWB applications

13.1.1 Mean Power

Table 17: Maximum value of mean power spectral density limit (e.i.r.p.) (CEPT report 45)

Frequency GHz	Without Mitigation techniques	With Mitigation techniques
f ≤ 1.6	-90	
1.6 < f ≤ 2.7	-85	
2.7 < f ≤ 3.1	-70	
3.1 < f ≤ 3.4	-70	-41.3 (Notes 1 & 2)
3.4 < f ≤ 3.8	-80	-41.3 (Notes 1 & 2)
3.8 < f ≤ 4.2	-70	-41.3 (Notes 1 & 2)
4.3 < f ≤ 4.8	-70	-41.3 (Notes 1 & 2)
4.8 < f ≤ 6.0	-70	
6.0 < f ≤ 8.5	-41.3	
8.5 < f ≤ 9.0	-65	-41.3 (Note 2)
9.0 < f ≤ 10.6	-65	
10.6 < f	-85	

NOTE 1: Within the bands 3.1 GHz to 4.8 GHz, devices implementing **Low Duty Cycle (LDC) mitigation technique** TS 102 754 and CEPT report 45 are permitted to operate with a maximum mean e.i.r.p. spectral density of -41.3 dBm / MHz and a maximum pear e.i.r.p. of 0 dBm defined in 50 MHz

NOTE 2: Within the bands 3.1 GHz to 4.8 GHz and 8.5 GHz to 9 GHz devices implementing **Detect & Avoid (DAA) mitigation technique** TS 102 754 and CEPT report 45 are permitted to operate with a maximum mean e.i.r.p. spectral density of -41.3 dBm / MHz and a maximum peak e.i.r.p. of 0 dBm defined in 50 MHz

13.1.2 Peak Power

Table 18: Maximum peak power limit

Frequency GHz	Without Mitigation techniques	With Mitigation techniques
f ≤ 1.6	-50	
1.6 < f ≤ 2.7	-45	
2.7 < f ≤ 3.1	-45	
3.1 < f ≤ 3.4	-36	0 (Notes 1 & 2)
3.4 < f ≤ 3.8	-40	0 (Notes 1 & 2)
3.8 < f ≤ 4.2	-30	0 (Notes 1 & 2)
4.2 < f ≤ 4.8	-30	0 (Notes 1 & 2)
4.8 < f ≤ 6.0	-30	
6.0 < f ≤ 8.5	0	

Frequency GHz	Without Mitigation techniques	With Mitigation techniques
8.5 < f ≤ 9.0	-25	0 (Note 2)
9.0 < f ≤ 10.6	-25	
10.6 < f	-45	

NOTE 1: Within the bands 3.1 GHz to 4.8 GHz, devices implementing **Low Duty Cycle (LDC) mitigation technique** TS 102 754 and CEPT report 45 are permitted to operate with a maximum mean e.i.r.p. spectral density of -41.3 dBm / MHz and a maximum peak e.i.r.p. of 0 dBm defined in 50 MHz

NOTE 2: Within the bands 3.1 GHz to 4.8 GHz and 8.5 GHz to 9 GHz devices implementing **Detect & Avoid (DAA) mitigation technique** TS 102 754 and CEPT report 45 are permitted to operate with a maximum mean e.i.r.p. spectral density of -41.3 dBm / MHz and a maximum pear e.i.r.p. of 0 dBm defined in 50 MHz

13.2 EN 302 065-02: Requirements for UWB location tracking

13.2.1 Classification of UWB systems for location tracking

Table 19: Classification of UWB systems

Classification	Description
LT1	These systems, operating in the 6 GHz to 9 GHz region, are intended for general location tracking of people and objects. They operate on an unlicensed basis. The transmitting terminals in these systems are mobile (indoors or outdoors), or fixed (indoors only). Fixed outdoor LT1 transmitters are not permitted. Typically, LT1 transmitters are mobile location tracking tags which are attached to people or objects, and tags are tracked using a fixed receiver infrastructure to only receive the UWB emission emitted by the tags.
LT2	These systems, operating in the 3.1 GHz to 4.8 GHz region, are intended for person and object tracking and industrial applications at well-defined locations. The transmitting terminals in these systems may be located indoors or outdoors, and may be fixed or mobile. They operate at fixed sites and may be subject to registration and authorization, provided local coordination with possible interference victims has been performed.
LAES	These systems, operating in the 3.1 GHz to 4.8 GHz region, are intended for tracking staff belonging to the fire and other emergency services, who need to work in dangerous situations. Being able to track such people, even when deep inside a building, provides an important enhancement to command and control and to their personal safety. Typically, an LAES system is deployed temporarily at the scene of a fire or other emergency in a building. Licenses may be required for user organization.

13.2.2 Mean Power

Table 20: Maximum values of mean power spectral density (e.i.r.p.) for LT1 equipment

Frequency GHz	Mean Power Spectral Density (e.i.r.p) dBm / MHz	
	Without DAA	With DAA
f ≤ 1.6	-90	
1.6 < f ≤ 2.7	-85	

Frequency GHz	Mean Power Spectral Density (e.i.r.p) dBm / MHz	
	Without DAA	With DAA
2.7 < f ≤ 3.1	-70	
3.1 < f ≤ 3.4	-70	
3.4 < f ≤ 3.8	-80	
3.8 < f ≤ 4.8	-70	
4.8 < f ≤ 6.0	-70	
6.0 < f ≤ 8.5	-41.3	
8.5 < f ≤ 9.0	-65	-41.3
9.0 < f ≤ 10.6	-65	
10.6 < f	-85	

Table 21: Maximum values of mean power spectral density for LT2 equipment

Frequency GHz	Mean Power Spectral Density (e.i.r.p) dBm / MHz			
	Fixed outdoor		Mobile & Fixed indoor	
	Without DAA	With DAA	Without DAA	With DAA
f ≤ 1.6	-90			
1.6 < f ≤ 2.7	-85			
2.7 < f ≤ 3.1	-70			
3.1 < f ≤ 3.4	-70	-41.3 (see note 1)	-70	-41.3 (see note 1)
3.4 < f ≤ 3.8	-41.3 (see note 1)		-41.3 (see notes 1 & 2)	
3.8 < f ≤ 4.8	-41.3 (see notes 1 & 3)		-41.3 (see notes 1 & 2)	
4.8 < f ≤ 6.0	-70			
6.0 < f ≤ 10.6	-70			
10.6 < f	-85			

NOTE 1: A maximum duty cycle of 5% per transmitter on time per second and a max T_{on} = 25ms also applies

NOTE 2: The duty cycle should also be limited to 1.5% per transmitter on time (T_{on}) per minute, or equipment should implement an alternative mitigation technique that provides at least equivalent protection.

NOTE 3: The maximum mean e.i.r.p spectral density in the band 4.2 to 4.4 GHz for emissions that appear 30° or greater above the horizontal plane should be less than -47.3 dBm / MHz

Table 22: Maximum values of mean power spectral density for LAES equipment

Frequency GHz	Mean Power Spectral Density (e.i.r.p) dBm / MHz	
	Without DAA	With DAA
f ≤ 1.6	-90	
1.6 < f ≤ 2.7	-85	
2.7 < f ≤ 3.1	-70	
3.1 < f ≤ 3.4	-70	-41.3 (see note)
3.4 < f ≤ 4.2	-21.3 (see note)	
4.2 < f ≤ 4.8	-41.3 (see note)	

Frequency GHz	Mean Power Spectral Density (e.i.r.p) dBm / MHz	
	Without DAA	With DAA
4.8 < f ≤ 6.0	-70	
6.0 < f ≤ 10.6	-70	
10.6 < f	-85	
NOTE: A maximum duty cycle of 5% per transmitter on time (T_{on}) per second also applies		

13.2.3 Peak Power

Table 23: Maximum peak power limit for LT1 equipment

Frequency GHz	Maximum value of peak power spectral density (dBm / 50 MHz)	
	Without DAA	With DAA
f ≤ 1.6	-50	
1.6 < f ≤ 2.7	-45	
2.7 < f ≤ 3.1	-36	
3.1 < f ≤ 3.4	-36	
3.4 < f ≤ 3.8	-40	
3.8 < f ≤ 4.8	-30	
4.8 < f ≤ 6.0	-30	
6.0 < f ≤ 8.5	0	
8.5 < f ≤ 9.0	-25	0
9.0 < f ≤ 10.6	-25	
10.6 < f	-45	

Table 24: Maximum peak power limit for LT2 equipment

Frequency GHz	Maximum value of peak power spectral density (dBm / 50 MHz)			
	Fixed outdoor LT2 transmitters		Mobile & Fixed indoor LT2 transmitters	
	Without DAA	With DAA	Without DAA	With DAA
f ≤ 1.6	-50			
1.6 < f ≤ 2.7	-45			
2.7 < f ≤ 3.1	-36			
3.1 < f ≤ 3.4	-36	0 (see note 1)	-36	0 (see note 1)
3.4 < f ≤ 3.8	0 (see note 1)		0 (see notes 1 & 2)	
3.8 < f ≤ 4.8	0 (see notes 1 & 3)		0 (see notes 1 & 2)	
4.8 < f ≤ 6.0	-30			
6.0 < f ≤ 10.6	-30			
10.6 < f	-45			

NOTE 1: A maximum duty cycle of 5% per transmitter on time per second and a max T_{on} = 25ms also applies

NOTE 2: The duty cycle should also be limited to 1.5% per transmitter on time (T_{on}) per minute, or equipment should implement an alternative mitigation technique that provides at least equivalent protection.

Frequency GHz	Maximum value of peak power spectral density (dBm / 50 MHz)			
	Fixed outdoor LT2 transmitters		Mobile & Fixed indoor LT2 transmitters	
	Without DAA	With DAA	Without DAA	With DAA
NOTE 3: The maximum mean e.i.r.p spectral density in the band 4.2 to 4.4 GHz for emissions that appear 30° or greater above the horizontal plane should be less than -47.3 dBm / MHz. See clause 4.1.1.4				

Table 25: Maximum peak power limit for LAES equipment

Frequency GHz	Maximum value of peak power spectral density (dBm / 50 MHz)	
	Without DAA	With DAA
f ≤ 1.6	-50	
1.6 < f ≤ 2.7	-45	
2.7 < f ≤ 3.1	-36	
3.1 < f ≤ 3.4	-36	0 (see note)
3.4 < f ≤ 4.2	20 (see note)	
4.2 < f ≤ 4.8	0 (see note)	
4.8 < f ≤ 6.0	-30	
6.0 < f ≤ 10.6	-30	
10.6 < f	-45	
NOTE: A maximum duty cycle of 5% per transmitter on time (T_{on}) per second also applies		

13.3 EN 302 065-03: Requirements for UWB devices for road & rail vehicles

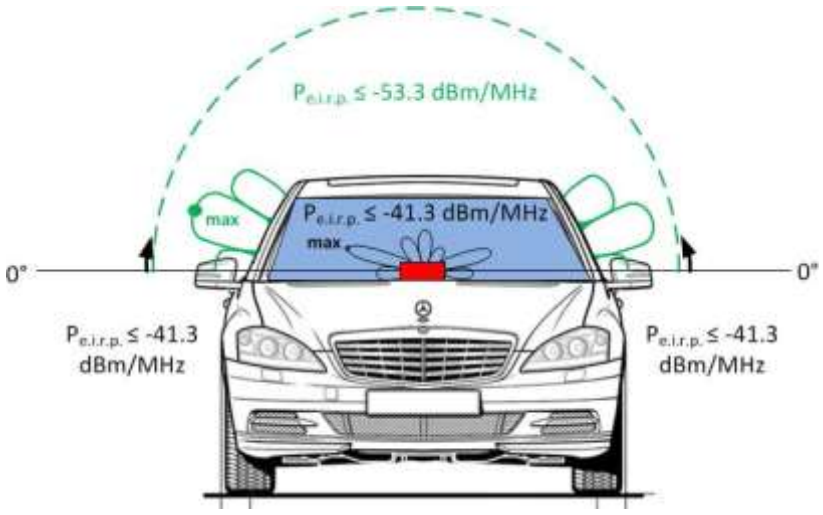

Figure 6: Principle of the regulations

13.3.1 Mean Power

Table 26: Mean power spectral density limit

Frequency	Mean Power Spectral Density (e.i.r.p) dBm / MHz

GHz	Devices with additional mitigation (e.g. DAA, LDC, TPC)	Devices without additional mitigation
f ≤ 1.6	-90	
1.6 < f ≤ 2.7	-85	
2.7 < f ≤ 3.1	-70	
3.1 < f ≤ 3.4	-41.3 (see notes 1 & 2)	-70
3.4 < f ≤ 3.8	-41.3 (see notes 1 & 2)	-80
3.8 < f ≤ 4.2	-41.3 (see notes 1 & 2)	-70
4.2 < f ≤ 4.8	-41.3 (see notes 1 & 2)	-70
4.8 < f ≤ 6.0	-70	
6.0 < f ≤ 8.5	-41.3 (see notes 1 & 3)	-53.3
8.5 < f ≤ 9.0	-41.3 (note 2)	-65
9.0 < f ≤ 10.6	-65	
10.6 < f	-85	
NOTE 1: Within the band 3.1 – 4.8 GHz and 6 – 8.5 GHz, devices implementing LDC mitigation technique (See clause 4.8) are permitted to operate with a maximum mean e.i.r.p spectral density of -41.3 dBm / MHz and a maximum peak e.i.r.p. of 0 dBm defined in 50 MHz. NOTE 2: Within the band 3.1 – 4.8 GHz and 8.5 – 9 GHz, devices implementing Detect & Avoid (DAA) mitigation technique (see clause 4.7) are permitted to operate with a maximum mean e.i.r.p spectral density of -41.3 dBm / MHz and a maximum peak e.i.r.p. of 0 dBm defined in 50 MHz. NOTE 3: Within the band 6 – 8.5 GHz, devices implementing Transmit Power Control (TPC) mitigation technique (see clause 4.6) and an exterior limit of (see clause 4.5) of -53.3 dBm / MHz are permitted to operate with a maximum mean e.i.r.p spectral density of -41.3 dBm / MHz and a maximum peak e.i.r.p. of 0 dBm defined in 50 MHz.		

13.3.2 Peak Power

Table 27: Maximum peak power limit

Frequency GHz	Maximum value of peak power limit (dBm measured in 50 MHz)	
	Devices with additional mitigation (e.g. DAA, LDC, TPC)	Devices without additional mitigation
f ≤ 1.6	-50	
1.6 < f ≤ 2.7	-45	
2.7 < f ≤ 3.1	-36	
3.1 < f ≤ 3.4	0 (see notes 1 & 2)	-36
3.4 < f ≤ 3.8	0 (see notes 1 & 2)	-40
3.8 < f ≤ 4.2	0 (see notes 1 & 2)	-30
4.2 < f ≤ 4.8	0 (see notes 1 & 2)	-30
4.8 < f ≤ 6.0	-30	
6.0 < f ≤ 8.5	0 (see notes 1 & 3)	-13.3
8.5 < f ≤ 9.0	0 (see note 2)	-25
9.0 < f ≤ 10.6	-25	
10.6 < f	-45	
NOTE 1: Within the band 3.1 – 4.8 GHz and 6 – 8.5 GHz, devices implementing Low Duty Cycle (LDC) mitigation technique (See clause 4.8) are permitted to operate with a maximum mean e.i.r.p spectral density of -41.3 dBm / MHz and a maximum peak e.i.r.p. of 0 dBm defined in 50 MHz.		

Frequency GHz	Maximum value of peak power limit (dBm measured in 50 MHz)	
	Devices with additional mitigation (e.g. DAA, LDC, TPC)	Devices without additional mitigation
Operation is in addition subject to the implementation of an exterior limit (see clause 4.5) of -53.3 dBm / MHz. NOTE 2: Within the band 3.1 – 4.8 GHz and 8.5 – 9 GHz, devices implementing Detect & Avoid (DAA) mitigation technique (see clause 4.7) are permitted to operate with a maximum mean e.i.r.p spectral density of -41.3 dBm / MHz and a maximum peak e.i.r.p. of 0 dBm defined in 50 MHz. Operation is in addition subject to the implementation of Transmit Power Control (TPC) mitigation technique (see clause 4.6) and san exterior limit (see clause 4.5) of -53.3 dBm / MHz. NOTE 3: Within the band 6 – 8.5 GHz, devices implementing Transmit Power Control (TPC) mitigation technique (see clause 4.6) and an exterior limit of (see clause 4.5) of -53.3 dBm / MHz are permitted to operate with a maximum mean e.i.r.p spectral density of -41.3 dBm / MHz and a maximum peak e.i.r.p. of 0 dBm defined in 50 MHz.		

14 APPENDIX 4: PRODUCT LABELLING AND MARKING

14.1 Product labelling requirements under the R&TTE directive

What is the manufacturer's obligation under the directive?		Applicable to: TTE	Class 1	Class 2	How might you fulfil this obligation?	Where? Equipment	User's Instructions	Packaging	Language	Examples
To conform with the essential requirement			o		After successfully undergoing a conformity assessment procedure and having prepared the technical documentation					
To identify the equipment			o		The model, manufacturer's name and serial number (or batch number) are indicated					
Marking	CE Marking		o		The CE marking is present	o	o	o		CE
Marking	NB-identification Number		o		The identification number of the Notified Body (NB) is indicated if it has been involved in the conformity assessment procedure	o	o	o		NBnr
Marking	Alert sign			o	The alert sign must be used once a restriction on use applies to the equipment and it must appear after the CE marking	o	o	o		
To notify the relevant authorities				o	The responsible person for placing the equipment on the market must notify its intention at least 4 weeks before the equipment is first placed on the national market. The form must be sent to the responsible national authority.					

What is the obligation under the directive?	Applicable to			How might you fulfil this obligation?	Where?			Language	Examples
	TTE	Class 1	Class 2		Equipment	User's Instructions	Packaging		
To indicate the intended use of the equipment	o			Written description **or** Description in visual form **or** By the use of terms known to the public	o	o	o	In the official language(s) of the region in which the equipment is placed on the market (multilingual region: all languages)	"Personnel tracking tag" "Garage door remote control" Illustration on the packaging, photo in the user manual, pictogram, equipment visible through the packaging Baby Monitor, Modem, GSM terminal…
To indicate the countries where the equipment is intended to be used			o	Written description **or** Description in abbreviated written form **or** With a pictogram		o	o		"This equipment may be operated in GB, IE" GB, FR, DE IT, CH 
To indicate any restrictions of use			o	Written description	o	o	o		"The use of this equipment requires a license in CH, HU, IE"
To indicate the interfaces of the networks to which the equipment is to be connected	o			Written description **or** By use of terms known to the public	o	o	o		"This telephone is intended for connection to the EI analogue network" ISDN, GSM etc.

What is the obligation under the directive?	Applicable to			How might you fulfil this obligation?	Where?			Language	Examples
	TTE	Class 1	Class 2		Equipment	User's Instructions	Packaging		
To issue a Declaration of Conformity (DoC)		o		**EITHER** The following indication is present with the equipment: "Hereby [Name of manufacturer], declares that this [type of equipment] is in compliance with the essential requirements and other provisions of Directive 1995/5/EC" to which must be added: - • The exact location from which a copy of the DoC may be obtained (Internet or postal address) or • A copy of the DoC in the original language is enclosed with the equipment **OR** A copy of the full DoC is attached to the equipment		o	o		See Section 15

14.2 Recognised EU country codes

Table 28: Recognised EU country codes

Country	ISO 3166 2-letter code	Country	ISO 3166 2-letter code	Country	ISO 3166 2-letter code	Country	ISO 3166 2-letter code
Austria	AT	Estonia	EE	Iceland	IS	Norway	NO
Belgium	BE	Spain	ES	Italy	IT	Poland	PL
Bulgaria	BG	Finland	FI	Liechtenstein	LI	Portugal	PT
Switzerland	CH	France	FR	Lithuania	LT	Romania	RO
Cyprus	CY	Great Britain	GB	Luxembourg	LU	Sweden	SE
Czech Republic	CZ	Greece	GR	Latvia	LV	Slovenia	SI
Germany	DE	Hungary	HU	Malta	MT	Slovakia	SK
Denmark	DK	Ireland	IE	Netherlands	NL	Turkey	TR

15 APPENDIX 3: EXAMPLE DECLARATION OF CONFORMITY

EC Declaration of Conformity

In accordance with EN ISO 17050-1:2004

We: New Company Ltd
Of: 25 New street, New Town, Ireland

in accordance with the following Directive(s): -

2014/35/EU The Low Voltage Directive
2014/53/EU The Radio and Telecommunications Terminal Equipment Directive

hereby declare that: -

Equipment	Personnel Tracking Tag
Model number	AccuLoc21
Serial Number	01234

is in conformity with the applicable requirements of the following documents: -

Reference No	Title	Edition / Date
EN 301 489-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements	08/2002 V1.4.1
EN 301 489-33	Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 33: Specific conditions for Ultra Wide Band (UWB) communications devices	12/2008 V1.1.1
EN 302 065-01	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD) using Ultra Wide Band technology (UWB); Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 1: Requirements for Generic UWB applications	15/04/14 V1.3.1
EN 302 065-02	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD) using Ultra Wide Band technology (UWB); Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 2: Requirements for UWB location tracking	15/04/14 V1.1.1

I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The unit complies with all applicable Essential Requirements of the Directives.

Signed: _____

Name: Mr John Smith