



TECHNICAL REPORT

**Short Range Devices (SRD)
using Ultra Wide Band (UWB);
Part 3: Worldwide UWB regulations between 3,1 and 10,6 GHz**

Reference

DTR/ERM-TGUWB-124

Keywords

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ETSI

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document is part 3 of a multi-part deliverable covering UWB signal characteristics and related mitigation techniques, as identified below:

- Part 1: "UWB signal characteristics and overview CEPT&ECC and EC regulation";
- Part 2: "UWB mitigation techniques";
- Part 3: "Worldwide UWB regulations between 3,1 GHz and 10,6 GHz".**

Modal verbs terminology

In the present document "**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).

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1 Scope

The present document presents a summary of the worldwide regulatory situation relating to UWB.

NOTE: The present document is a snapshot of the known UWB regulation world wide at May 2016. The reader is invited to report any changes and additional information on UWB regulations and standards to ETSI.

2 References

2.1 Normative references

As informative publications shall not contain normative references this clause shall remain empty.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI EN 302 065-1 (V1.3.1): "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".
- [i.2] ETSI EN 302 065-2 (V1.1.1): "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".
- [i.3] ETSI EN 302 065-3 (V1.1.1): "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 3: Requirements for UWB devices for road and rail vehicles".
- [i.4] ETSI EN 302 066-1: "ETSI EN 306 066-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Ground- and Wall- Probing Radar applications; Part 1: Technical characteristics and test methods".
- [i.5] ETSI EN 302 066-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Ground- and Wall- Probing Radar applications (GPR/WPR) imaging systems; Part 2: Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive".
- [i.6] Industry Canada: "Devices Using Ultra-Wideband (UWB) Technology", RSS-220, Issue 1, March 2009.
- [i.7] FCC Code of Federal Regulations 47.
- [i.8] CITC RI085 Issue 1, 10/01/2010.
- [i.9] Radio communications (Low Interference Potential Devices) Class Licence Variation Notice 2010 (No. 1) and subsequent amendments including compilation made 14th July 2014.
- [i.10] MIIT File 354.

- [i.11] ARIB: "UWB (Ultra-Wideband) Radio Systems", STD-T91 Version 2.0.
- [i.12] KCC Radio Equipment Rules: "Revised 3/13/2012" KCC notice No. 2012-12.
- [i.13] Communications and Multimedia Commission SKMM SRSP-549 UWB.
- [i.14] New Zealand Gazette, 31/7/2008, No. 119, p. 3145.
- [i.15] IDA: "Technical Specification for Ultra Wideband (UWB) Devices", Issue 1 Rev1, May 2011.
- [i.16] ETSI TR 103 181-1 (V1.1.1): "Short Range Devices (SRD) using Ultra Wide Band (UWB); Technical Report Part 1: UWB signal characteristics and overview CEPT/ECC and EC regulation".
- [i.17] ETSI TR 103 181-2 (V1.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD) using Ultra Wide Band (UWB); Transmission characteristics Part 2: UWB mitigation techniques".
- [i.18] ETSI EN 302 065 (V1.2.1): "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".
- [i.19] Recommendation ITU-R SM 1754: "Measurement techniques of ultra-wideband transmissions".
- [i.20] Recommendation ITU-R SM.1757: "Impact of devices using ultra-wideband technology on systems operating within radiocommunication services".
- [i.21] ETSI TS 103 060: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Method for a harmonized definition of Duty Cycle Template (DCT) transmission as a passive mitigation technique used by short range devices and related conformance test methods".
- [i.22] ECC Recommendation 70-03: "Relating to the use of Short Range Devices (SRD)".
- [i.23] ECC Decision 06(04): "The availability of frequency bands for the introduction of Wide Band Digital Land Mobile PMR/PAMR in the 400 MHz and 800/900 MHz bands".
- [i.24] ETSI EN 302 500-2: "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 8,5 GHz; Part 2: Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive".
- [i.25] ETSI 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".
- [i.26] ETSI EN 301 489-32: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 32: Specific conditions for Ground and Wall Probing Radar applications".
- [i.27] ETSI 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".
- [i.28] Addendum 16 the GRFC decision May 7, 2007, No. 07-20-03-001.
- [i.29] Addendum to the GRFC decision from December 15, 2009, No. 5/9/02-05-02.

3 Definitions, symbols and abbreviations

3.1 Definitions

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

activity factor: reflects the effective transmission time ratio

maximum mean e.i.r.p. spectral density: highest signal strength measured in any direction at any frequency within the defined range

NOTE: The mean e.i.r.p. spectral density is measured with a 1 MHz resolution bandwidth, an RMS detector and an averaging time of 1 ms or less.

maximum peak e.i.r.p.: highest signal strength measured in any direction at any frequency within the defined range

NOTE: The peak e.i.r.p. is measured within a 50 MHz bandwidth centred on the frequency at which the highest mean radiated power occurs.

3.2 Symbols

For the purposes of the present document, the symbols given in ETSI TS 103 060 [i.21] and the following apply:

f_c	Centre frequency
f_M	frequency at which the highest radiated emission occurs

3.3 Abbreviations

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

AC	Alternating Current
ACMA	Australian Communications and Media Authority
ARIB	Association of Radio Industries and Businesses (Japan)
CEPT	Commission Européenne des Postes et Télécommunications
CFR	Code of Federal Regulations (USA)
CISPR	Comité International Spécial des Perturbations Radioélectriques
CITC	Communications and Information Technology Commission (Saudi Arabia)
DAA	Detect And Avoid
e.i.r.p.	equivalent isotropically radiated power
EC	European Commission
ECC	European Communication Comity
EIRP	Effective Isotropic Radiated Power
EMEA	Europe, Middle East and Africa
FCC	Federal Communications Commission (USA)
GPR	Ground Probing Radar
GRFC	General Radio Frequency Centre
IDA	Info-communication Development Authority of Singapore
ILAC	International Laboratory Accreditation Cooperation
KCC	Korean Communication Commission (Korea)
LAES	Location tracking Application for Emergency and disaster Situations
LDC	Low Duty Cycle
MIIT	Ministry of Industry & Information Technology (China)
RLM	Robotic Lawn Mower
RMS	Root Mean Square
SKMM	Suruhanjaya Komunikasi dan Multimedia Malaysia (Malaysian Communications and Multimedia Commission)
TBC	To Be Confirmed
UAE	United Arab Emirates

USA United States of America
WPR Wall Probing Radar

4 Global Summary

4.1 Introduction

This clause presents a summary of the global regulatory situation relating to UWB in the frequency range from 3,1 GHz to 10,6 GHz. Each jurisdiction in the world is considered and the current situation presented in tabular form. This clause is only concerned with UWB as a communications medium, it does not concern itself with other UWB uses for which there may be additional regulations (e.g. ground penetrating radar, through wall imaging systems or automotive radar applications).

Colours are used to give a visual indication of the status with the following meanings.

Table 1: Colour legend

Table Colour	What does this mean?
	Specific UWB regulations exist in the named jurisdiction
	Specific UWB regulations do not exist in the named jurisdiction. Either: <ul style="list-style-type: none"> the regulatory regime remains to be clarified; or the regulations that most typically apply (usually FCC or ETSI) are listed

The various headings in the tables that follow have the following meanings.

Table 2: Heading legend

Table Heading	What does this mean?	Potential responses
Country	The name of the jurisdiction	
Do Specific UWB regulations exist?	Has the communications regulatory body in this jurisdiction introduced specific regulations governing the use of UWB in this jurisdiction?	Y = Yes N = No
What is the regulatory regime?	What is the source of the regulations governing the use of UWB in this jurisdiction?	Where the jurisdiction has implemented specific regulations the source reference is listed. Where the jurisdiction has not implemented specific regulations, the usual approach to such matters is described
What frequency range is permitted?	What range of frequencies is permitted to be used for UWB transmission at the mean EIRP under the applicable regulatory regime?	Given in GHz range of frequencies e.g. 6,0 - 8,5 GHz
Do these regulations permit outdoor use?	Does the applicable regulatory regime permit use of UWB outdoors?	Y = Yes, regulations permit use outdoors TBC = To be confirmed N = No, regulations do not permit use outdoors
e.i.r.p. (dBm / MHz)	What is the maximum value of mean power spectral density permitted under the applicable regulatory regime?	Where known this is given in dBm / MHz otherwise it is marked as TBC
Emission profile	What is the spectral emissions profile allowed under the applicable regulatory regime?	This column refers to later clause in the present document

4.2 Europe, Middle East and Africa

4.2.1 Europe

A short overview is given in table 3, for more details please check, clause 5 and ETSI TR 103 181-1 [i.16].

Table 3: Overview Europe

	Country	Do specific UWB regs exist?	What is the regulatory regime?	What frequency range is permitted (GHz)?	Do these regs permit outdoor use?	Max mean e.i.r.p. (dBm / MHz)	Emission Profile
1	Albania	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
2	Andorra	N	Generally will approve ETSI compliant equipment	3,1 - 9,0	Y	-41,3	ETSI clause 5
3	Austria	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
4	Belarus	N	Generally will approve ETSI compliant equipment	3,1 - 9,0	Y	-41,3	ETSI clause 5
5	Belgium	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
6	Bosnia & Herzegovina	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
7	Bulgaria	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
8	Canary Islands	Y	Telecoms matters overseen by government of Spain	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
9	Croatia	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
10	Cyprus	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
11	Czech Republic	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5

	Country	Do specific UWB regs exist?	What is the regulatory regime?	What frequency range is permitted (GHz)?	Do these regs permit outdoor use?	Max mean e.i.r.p. (dBm / MHz)	Emission Profile
12	Denmark	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
13	Estonia	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
14	Finland	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note 1) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
15	France	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
16	Germany	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
17	Gibraltar	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
18	Greece	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
19	Hungary	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
20	Iceland	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
21	Ireland	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
22	Italy	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
23	Latvia	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
24	Lithuania	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5

	Country	Do specific UWB regs exist?	What is the regulatory regime?	What frequency range is permitted (GHz)?	Do these regs permit outdoor use?	Max mean e.i.r.p. (dBm / MHz)	Emission Profile
25	Luxembourg	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
26	Macedonia	N	TBC	TBC			
27	Malta	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
28	Moldova	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
29	Monaco	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
30	Montenegro	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
31	Netherlands	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
32	Norway	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
33	Poland	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
34	Portugal	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
35	Romania	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
36	Russia	Y	Has implemented ECC Rec 70-03 [i.22]but with local modifications Addendum No. 16 the GRFC decision May 7, 2007 No. 07-20-03-001 [i.28] Addendum to the GRFC decision from December 15, 2009 # 5/9/02-05-02 [i.29]	6,0 - 8,1 8,625 - 9,15 9,15 - 10,6	Y	-47 -45 (in 9,15 to 10,6 freq range)	Clause 5
37	San Marino	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5

	Country	Do specific UWB regs exist?	What is the regulatory regime?	What frequency range is permitted (GHz)?	Do these regs permit outdoor use?	Max mean e.i.r.p. (dBm / MHz)	Emission Profile
38	Serbia	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
39	Slovakia	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
40	Slovenia	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
41	Spain	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
42	Sweden	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
43	Switzerland	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
44	Turkey	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
45	United Kingdom	Y	ECC Rec 70-03 [i.22] / ECC Decision 06(04) [i.23] / ETSI EN 302 065 [i.18]	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
46	Ukraine	N	ECC Rec 70-03[i.22] under consideration but not yet adopted	TBC			

NOTE: Mitigation techniques required.

4.2.2 Middle East

Table 4: Overview Middle East

	Country	Do specific UWB regs exist?	What is the regulatory regime?	What frequency range is permitted?	Do these regs permit outdoor use?	EIRP (dBm / MHz)	Emission Profile
47	Bahrain	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
49	Iran	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
49	Iraq	N	TBC	TBC			
50	Israel	N	Generally will approve ETSI compliant equipment. Confusion exists over the approval status of UWB equipment. There are rumours that the low band is being allocated for UWB trials.	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
51	Jordan	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
52	Kuwait	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
53	Lebanon	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
54	Oman	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
55	Qatar	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
56	Saudi Arabia	Y	CITC RI085 [i.8]	6,0 - 8,5	Y	-41,3	Clause 6
57	Syria	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
58	UAE	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5

	Country	Do specific UWB regs exist?	What is the regulatory regime?	What frequency range is permitted?	Do these regs permit outdoor use?	EIRP (dBm / MHz)	Emission Profile
59	Yemen	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5

NOTE: Mitigation techniques required.

4.2.3 Africa

Table 5: Africa

	Country	Do specific UWB regs exist?	What is the regulatory regime?	What frequency range is permitted?	Do these regs permit outdoor use?	EIRP (dBm / MHz)	Emission Profile
60	Algeria	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
61	Angola	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
62	Benin	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
63	Burkina Faso	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
64	Cameroon	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
65	Cape Verde	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
66	Central African Republic	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
67	Chad	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
68	Democratic Republic of the Congo	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
69	Djibouti	N	TBC	TBC			
70	Egypt	N	TBC	TBC			
71	Ethiopia	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5

	Country	Do specific UWB regs exist?	What is the regulatory regime?	What frequency range is permitted?	Do these regs permit outdoor use?	EIRP (dBm / MHz)	Emission Profile
72	Gabon	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
73	Gambia	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
74	Ghana	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
75	Guinea-Bissau	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
76	Ivory Coast	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
77	Kenya	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
78	Lesotho	N	Generally will approve equipment approved for use in South Africa	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
79	Liberia	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
80	Libya	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
81	Madagascar	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
82	Malawi	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
83	Mali	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
84	Mauritius	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
85	Morocco	N	TBC	TBC			
86	Mozambique	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
87	Namibia	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
88	Niger	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
89	Nigeria	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
90	Rwanda	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5

	Country	Do specific UWB regs exist?	What is the regulatory regime?	What frequency range is permitted?	Do these regs permit outdoor use?	EIRP (dBm / MHz)	Emission Profile
91	Senegal	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
92	Sierra Leone	N	Generally will approve either ETSI or FCC compliant equipment	3,1 - 9,0	Y	-41,3	FCC section 7 ETSI clause 5
93	Somalia	N	TBC	TBC			
94	South Africa	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
95	Sudan	N	TBC	TBC			
96	Swaziland	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
97	Tanzania	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
98	Togo	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
99	Tunisia	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
100	Uganda	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
101	Zambia	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
102	Zimbabwe	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5

NOTE: Mitigation techniques required.

4.3 Asia Pacific

Table 6: Overview Asia Pacific

#	Country	Do specific UWB regs exist?	What is the regulatory regime?	What frequency range is permitted (GHz)?	Do these regs permit outdoor use?	EIRP (dBm / MHz)	Emission Profile
103	Afghanistan	N	TBC	TBC			
104	Armenia	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
105	Australia	Y	Radio Communications (Low Interference Potential Devices) Class Licence 2000 as modified July 2014	6.0 - 8.4	Y	-41,3	Clause 9
106	Azerbaijan	N	TBC	TBC			
107	Bangladesh	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
108	Brunei	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
109	Cambodia	N	TBC	TBC			
110	China	Y	MIIT Wireless File 354 (2008) [i.10]	6.0 - 9.0	Y	-41	Clause 10
111	Cook Islands	N	TBC	TBC			
112	Fiji	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
113	French Polynesia	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
114	Georgia	N	TBC	TBC			
115	Guam	Y	Territory of the USA	3,1 - 10,6	Y	-41,3	FCC section 7
116	Hong Kong	N	Specific regulations do not currently exist. Regulator is currently considering regulations allowing the use of unlicensed UWB in the range 3,4 - 8,5 GHz. Historically, HK has approved ETSI certified equipment	3,4 - 4,2 (see note) 4,2 - 4,8 6,0 - 8,5 (proposed)	TBC	-41,3 (proposed)	Clause 7 (proposed)
117	India	N	Specific regulations do not currently exist. Regulator is currently considering regulations allowing the use of unlicensed UWB in the range 6,0 - 7,25 GHz. Historically, India has approved ETSI certified equipment	6,0 - 7,25 (proposed)	TBC	-41 (proposed)	Clause 7 (proposed)

#	Country	Do specific UWB regs exist?	What is the regulatory regime?	What frequency range is permitted (GHz)?	Do these regs permit outdoor use?	EIRP (dBm / MHz)	Emission Profile
118	Japan	Y	ARIB STD-T91 Ver. 2.0 2015 [i.11]	3,4 - 4,8 (see note) 7,25 - 10,5	N	-41,3	Clause 11
119	Kazakhstan	N	Generally will approve ETSI compliant equipment	3,1 - 9,0	Y	-41,3	ETSI clause 5
120	Korea, North	N	TBC	TBC			
121	Korea, South	Y	Korean Communications Commission Republic of Korea	3,1 - 4,8 (see note) 7,2 - 10,2	Y	-41,3	Clause 12
122	Kyrgyzstan	N	TBC	TBC			
123	Laos	N	TBC	TBC			
124	Macau	N	TBC	TBC			
125	Malaysia	Y	SKMM SRSP-549 UWB, 5 th December 2013 [i.13]. Refers to ETSI EN 302 065 [i.18], ETSI EN 302 066-1 [i.4] and Recommendation ITU-R SM.1754 [i.19]	6,0 - 8,5	Y	-41,3	Clause 13
126	Myanmar	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
127	Nepal	N	TBC	TBC			
128	New Caledonia	Y	Telecoms matters overseen by government of France	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
129	New Zealand	Y	New Zealand Gazette, 31/7/2008, No. 119, p. 3145 [i.14]. Refers to ETSI EN 302 065 [i.18]	6.0 - 8.5	Y	-41,3	Clause 14
130	Pakistan	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
131	Papua New Guinea	N	Generally will approve FCC compliant equipment	3,1 - 10,6	Y	-41,3	FCC section 7
132	Philippines	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
133	Reunion	Y	Telecoms matters overseen by government of France	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5

#	Country	Do specific UWB regs exist?	What is the regulatory regime?	What frequency range is permitted (GHz)?	Do these regs permit outdoor use?	EIRP (dBm / MHz)	Emission Profile
134	Samoa (Independent State of)	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
135	Singapore	Y	IDA TS UWB Issue 1 Rev 1, May 2011 [i.15]. Refers to ETSI EN 302 500 [i.24] and ETSI EN 302 065 [i.18]	3,4 - 4,2 (see note) 4,2 - 4,8 6,0 - 8,5	Y	-41,3	Clause 15
136	Sri Lanka	N	TBC	TBC			
137	Thailand	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
138	Turkmenistan	N	TBC	TBC			
139	Uzbekistan	N	TBC	TBC			
140	Vietnam	N	TBC	TBC			

NOTE: Mitigation techniques required.

4.4 Americas

4.4.1 North America

Table 7: Overview North America

#	Country	Do specific UWB regs exist?	What is the regulatory regime?	What frequency range is permitted (GHz)?	Do these regs permit outdoor use?	EIRP (dBm / MHz)	Emission Profile
141	Antigua & Barbuda	N	Generally will approve FCC certified equipment	3,1 - 10,6	Y	-41,3	FCC section 7
142	Aruba	N	Generally will approve FCC certified equipment	3,1 - 10,6	Y	-41,3	FCC section 7
143	Bahamas	N	Generally will approve FCC certified equipment	3,1 - 10,6	Y	-41,3	FCC section 7
144	Barbados	N	Generally will approve FCC certified equipment	3,1 - 10,6	Y	-41,3	FCC section 7
145	Bermuda	N	Generally will approve FCC certified equipment	3,1 - 10,6	Y	-41,3	FCC section 7
146	British Virgin Islands	N	Generally will approve FCC certified equipment	3,1 - 10,6	Y	-41,3	FCC section 7
147	Canada	Y	Industry Canada RSS-220 specification [i.6]	4,75 - 10,6	Y	-41,3	Clause 8
148	Cayman Islands	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
149	Costa Rica	N	Generally will approve FCC certified equipment	3,1 - 10,6	Y	-41,3	FCC section 7
150	Cuba	N	TBC	TBC			
151	Curacao	N	Generally will approve FCC certified equipment	3,1 - 10,6	Y	-41,3	FCC section 7
152	Dominica	N	Generally will approve FCC certified equipment	3,1 - 10,6	Y	-41,3	FCC section 7
153	Dominican Republic	N	Generally will approve FCC certified equipment	3,1 - 10,6	Y	-41,3	FCC section 7
154	El Salvador	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
155	Grenada	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
156	Guadeloupe	Y	Telecoms matters overseen by government of France	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
157	Guatemala	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5

#	Country	Do specific UWB regs exist?	What is the regulatory regime?	What frequency range is permitted (GHz)?	Do these regs permit outdoor use?	EIRP (dBm / MHz)	Emission Profile
158	Haiti	N	Generally will approve FCC certified equipment	3,1 - 10,6	Y	-41,3	FCC section 7
159	Honduras	N	Generally will approve FCC certified equipment	3,1 - 10,6	Y	-41,3	FCC section 7
160	Martinique	Y	Telecoms matters overseen by government of France	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
161	Jamaica	N	Generally will approve FCC certified equipment	3,1 - 10,6	Y	-41,3	FCC section 7
162	Mexico	N	Generally will approve FCC certified equipment	3,1 - 10,6	Y	-41,3	FCC section 7
163	Nicaragua	N	Generally will approve FCC certified equipment	3,1 - 10,6	Y	-41,3	FCC section 7
164	Panama	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
165	St Kitts & Nevis	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
166	St Lucia	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
167	St Vincent & the Grenadines	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
168	Trinidad & Tobago	N	Generally will approve FCC certified equipment	3,1 - 10,6	Y	-41,3	FCC section 7
169	USA	Y	FCC CFR 47 Part 15 [i.7]	3,1 - 10,6	Y	-41,3	FCC section 7
170	US Virgin islands	Y	Telecoms matters overseen by government of USA	3,1 - 10,6	Y	-41,3	FCC section 7

NOTE: Mitigation techniques required.

4.4.2 South America

Table 8: Overview South America

#	Country	Do specific UWB regs exist?	What is the regulatory regime?	What frequency range is permitted (GHz)?	Do these regs permit outdoor use?	EIRP (dBm / MHz)	Emission Profile
171	Argentina	N	TBC	TBC			
172	Bolivia	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
173	Brazil	N	TBC	TBC			
174	Chile	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
175	Colombia	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
176	Ecuador	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
177	Falkland Islands	N	Generally will approve ETSI compliant equipment	3,1 - 4,8 (see note) 6,0 - 8,5 8,5 - 9,0 (see note)	Y	-41,3	ETSI clause 5
178	Guyana	N	Generally will approve FCC compliant equipment	3,1 - 10,6	Y	-41,3	FCC section 7
179	Paraguay	N	Generally will approve FCC compliant equipment	3,1 - 10,6	Y	-41,3	FCC section 7
180	Peru	N	Generally will approve either ETSI or FCC compliant equipment	FCC section 7 ETSI clause 5	Y	-41,3	FCC section 7 ETSI clause 5
181	Uruguay	N	Generally will approve FCC compliant equipment	3,1 - 10,6	Y	-41,3	FCC section 7
182	Venezuela	N	Generally will approve FCC compliant equipment	3,1 - 10,6	Y	-41,3	FCC section 7

NOTE: Mitigation techniques required.

5 EMEA: Europe: EC

5.1 UWB Regulatory Authority

Regulatory Authority: European Commission and CEPT/ECC

Standards Authority: ETSI

5.2 Applications

- Communications
- Locations Tracking
- Road and rail vehicles
- Ground probing radar

For more information please see ETSI TR 103 181-1 [i.16].

5.3 Requirements

5.3.1 Communication devices

Regulations are defined in ETSI EN 302 065-1 [i.1].

Applies to fixed (indoor only), mobile or portable applications.

5.3.2 Location tracking devices

Regulations are defined in ETSI EN 302 065-2 [i.2].

Three different types of location tracking system are defined:

- **LT1 systems:** 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 systems:** 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 systems:** 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.

Table 9: Operating frequency bands per system type under ETSI EN 302 065-2 [i.2] - Europe

System type	Mode	Frequency band
LT1	Transmit	6,0 - 9,0 GHz
	Receive	6,0 - 9,0 GHz
LT2	Transmit	3,1 - 4,8 GHz
	Receive	3,1 - 4,8 GHz
LAES	Transmit	3,1 - 4,8 GHz
	Receive	3,1 - 4,8 GHz

5.3.3 Road & Rail mounted devices

Regulations are defined in ETSI EN 302 065-3 [i.3].

5.3.4 Ground Probing Radar

Regulations are defined in ETSI EN 302 066-1 [i.4] and ETSI EN 302 066-2 [i.5].

5.4 Mitigation Techniques

5.4.1 General

Various techniques are described:

- Low Duty Cycle (LDC)
- Detect And Avoid (DAA)

Additional mitigation techniques used and implemented in CEPT/ECC and EC are described in more detail in ETSI TR 103 181-2 [i.17].

5.4.2 Low Duty Cycle (LDC)

Table 10: Low duty cycle baseline limits

Parameter	Symbol	Limit
Max transmitter on time	$T_{on\ max}$	5 ms
Mean transmitter off time	$T_{off\ mean}$	≥ 38 ms (averaged over 1 s)
Sum transmitter off time	$\sum T_{off}$	> 950 ms per second
Sum transmitter on time	$\sum T_{on}$	< 18 s per hour

5.4.3 Detect And Avoid (DAA)

Before transmitting, a system should sense the channel within its operative bandwidth in order to detect the possible presence of other systems. If another system is detected, the first system should avoid transmission until the detected system disappears.

6 EMEA: Middle East: Saudi Arabia

6.1 Regulatory Authority

The Communications and Information Technology Commission of Saudi Arabia (CITC).

The rules are as stated in CITC RI085 Issue 1 [i.8].

6.2 UWB Definition

Not stated. Refers to ETSI rules.

6.3 Applications

Not stated. Refers to ETSI rules.

6.4 Requirements

Excerpt of [i.8]:

It is recommended that test reports are obtained from a laboratory that has been accredited by a body that is a member of the ILAC Mutual Recognition Arrangement.

Specific reference is made to the following ETSI documents:

- ETSI EN 302 065 [i.18] (no revision stated).
- ETSI EN 302 066-2 [i.5] (no revision stated).
- ETSI EN 302 500-2 [i.24] (no revision stated).
- ETSI EN 301 489-1 [i.25] (no revision stated).
- ETSI EN 301 489-32 [i.26] (no revision stated).
- ETSI EN 301 489-33 [i.27] (no revision stated).

Excerpt of [i.8]:

"In addition to meeting the above requirements, all equipment must comply with the requirement of CITC specification GEN001, be safe and must not adversely affect other electrical equipment."

6.5 Limits

Excerpt of [i.8]:

"Emission limits are the same as those specified in the original ETSI EN 302 065 with the exception that only the high band channels (6.0 to 8.5 GHz) are permitted to transmit at the maximum mean level of -41.3 dBm / MHz."

Table 12: e.i.r.p. emission limits Saudi Arabia [i.8]

Frequency	Max. mean e.i.r.p. (dBm/MHz)	Max. Peak e.i.r.p. (dBm / 50MHz)
30 - 1 610 MHz	- 90.0	-50.0
1.60 - 2.70 GHz	- 85.0	- 45.0
2.70 - 3.40 GHz	- 70.0	- 36.0
3.40 - 3.80 GHz	- 80.0	- 40.0
3.80 - 4.20 GHz	-70.0	- 30.0
4.20 - 4.80 GHz	-70.0	- 30.0
4.80 - 6.00 GHz	-70.0	- 30.0
6.00 - 8.50 GHz	- 41.3	0.0
8.50 - 10.60 GHz	- 65.0	- 25.0
> 10.6GHz	- 85.0	- 45.0

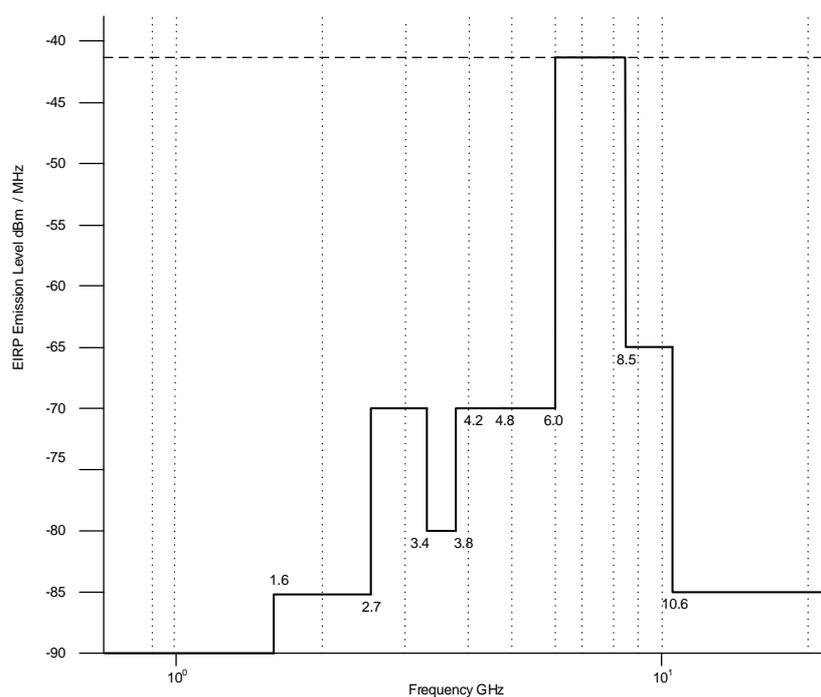


Figure 1: Max mean e.i.r.p. emission limits - Saudi Arabia

6.6 Mitigation Techniques

None stated explicitly. Refers to ETSI rules.

7 Americas, North: United States

7.1 Regulatory Authority

Federal Communications Commission

UWB rules in the United States of America are defined in part 15, subpart F of the FCC Code of Federal Regulations [i.7]. The following subsections of part 15 are particularly relevant.

Table 11: Relevant sub-parts of part 15 of the CFR

Subsection of the CFR part 15	Description
15.509	GPR and wall imaging systems
15.510	Through wall imaging systems
15.511	Surveillance systems
15.513	Medical imaging systems
15.515	Vehicular radar systems
15.517	Indoor systems
15.519	Hand-held UWB systems
15.521	Technical requirements applicable to all UWB devices

7.2 UWB Definition

Ultra-wideband transmitter defined as an intentional radiator that, at any point in time, has a UWB bandwidth equal to or greater than 500 MHz or a fractional bandwidth $> 0,2$.

7.3 Applications

- Ground penetrating radar & wall imaging systems
- Through wall imaging systems
- Surveillance systems
- Medical imaging systems
- Vehicular radar systems
- Indoor systems
- Handheld systems

7.4 Requirements

7.4.1 General

From FCC Code of Federal Regulations 47 [i.7]:

- a) *"UWB devices may not be employed for the operation of toys. Operation on board an aircraft, a ship or a satellite is prohibited.*
- b) *Manufacturers and users are reminded of the provisions of §15.203 (antennas) and §15.204 (external amplifiers).*
- c) *Emissions from digital circuitry used to enable the operation of the UWB transmitter shall comply with the limits in §15.209, rather than the limits specified in this subpart, provided it can be clearly demonstrated that those emissions from the UWB device are due solely to emissions from digital circuitry contained within the transmitter and that the emissions are not intended to be radiated from the transmitter's antenna. Emissions from associated digital devices, as defined in §15.3(k), e.g., emissions from digital circuitry used to control additional functions or capabilities other than the UWB transmission, are subject to the limits contained in Subpart B of this part."*

7.4.2 Ground penetrating radar (GPR) & wall imaging systems under CFR §15.509

Ground penetrating radar (GPR) is defined as a field disturbance sensor that is designed to operate only when in contact with, or within one meter of, the ground for the purpose of detecting or obtaining the images of buried objects or determining the physical properties within the ground. The energy from the GPR is intentionally directed down into the ground for this purpose.

A Wall imaging system is a field disturbance sensor that is designed to detect the location of objects contained within a "wall" or to determine the physical properties within the "wall." The "wall" is a concrete structure, the side of a bridge, the wall of a mine or another physical structure that is dense enough and thick enough to absorb the majority of the signal transmitted by the imaging system. This category of equipment does not include products such as "stud locators" that are designed to locate objects behind gypsum, plaster or similar walls that are not capable of absorbing the transmitted signal. This definition has arisen to distinguish this application from through wall surveillance uses of ultra wideband technology.

§15.509 [i.7] lists the technical requirements for the GPRs and wall imaging systems; specifically:

- a) *"the UWB bandwidth must be below 10.6 GHz*
- b) *Operation is limited to GPRs and wall imaging systems operated for purposes associated with law enforcement, fire fighting, emergency rescue, scientific research, commercial mining, or construction. This provision and reference to Part 90 eliminate the need for individual operator licensing for such devices.*
- c) *The operation of imaging systems requires coordination according to §15.525. Essentially, the users of UWB imaging devices shall supply operational areas to the FCC Office of Engineering and Technology.*
- d) *A GPR that is designed to be operated while being hand held and a wall imaging system shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. In lieu of a switch located on the imaging system, it is permissible to operate an imaging system by remote control provided the imaging system ceases transmission within 10 seconds of the remote switch being released by the operator.*
- e) *Emission limits are listed in paragraph 7.5.1."*

7.4.3 Through D-wall imaging systems under CFR §15.510

Section 15.510 applies to Through-Wall imaging systems. They are designed to detect the location or movement of persons or objects that are located on the other side of an opaque structure such as a wall or a ceiling. This category of equipment may include products such as "stud locators" that are designed to locate objects behind gypsum, plaster or similar walls that are not thick enough or dense enough to absorb the transmitted signal.

Relevant technical requirements are listed in FCC Code of Federal Regulations 47 [i.7] as follows:

- a) *"The UWB bandwidth must be below 960 MHz or the centre frequency, f_c , and the frequency at which the highest radiated emission occurs, f_M , must be contained between 1990 MHz and 10600 MHz.*
- b) *Operation is limited to through-wall imaging systems operated by law enforcement, emergency rescue or firefighting organizations that are under the authority of a local or state government.*
- c) *For through-wall imaging systems operating with the UWB bandwidth below 960 MHz*
 1. *Parties operating this equipment must be eligible for licensing*
 2. *Operation of these imaging systems requires coordination, as detailed in §15.525.*

- d) For equipment operating with f_C and f_M between 1,990 MHz and 10,600 MHz:
1. Parties operating this equipment must hold a license issued by the Federal Communications Commission to operate a transmitter in the Public Safety Radio Pool under part 90 of this chapter. The license may be held by the organization for which the UWB operator works on a paid or volunteer basis.
 2. This equipment may be operated only for law enforcement applications, the providing of emergency services, and necessary training operations.
- e) Through-wall imaging systems operating under the provisions of this section shall bear the following or similar statement in a conspicuous location on the device: "Operation of this device is restricted to law enforcement, emergency rescue and firefighter personnel. Operation by any other party is a violation of 47 U.S.C. 301 and could subject the operator to serious legal penalties."
- f) The imaging system shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. In lieu of a switch located on the imaging system, it is permissible to operate an imaging system by remote control provided the imaging system ceases transmission within 10 seconds of the remote switch being released by the operator.
- g) Emission limits are listed in paragraph 7.5.2."

7.4.4 Surveillance systems under CFR §15.511

Excerpt of [i.7]:

- a) "The UWB bandwidth of an imaging system operating under the provisions of this section must be contained between 1,990 MHz and 10,600 MHz.
- b) Operation under the provisions of this section is limited to fixed surveillance systems operated by law enforcement, fire or emergency rescue organizations or by manufacturers licensees, petroleum licensees or power licensees as defined in §90.7 of this chapter.
 1. Parties operating under the provisions of this section must be eligible for licensing under the provisions of part 90 of this chapter.
 2. The operation of imaging systems under this section requires coordination, as detailed in §15.525.
- c) Imaging systems operating under the provisions of this section shall bear the following or similar statement in a conspicuous location on the device: "Operation of this device is restricted to law enforcement, fire and rescue officials, public utilities, and industrial entities. Operation by any other party is a violation of 47 U.S.C. 301 and could subject the operator to serious legal penalties."

7.4.5 Medical imaging systems under CFR §15.513

Excerpt of [i.7]:

- a) "The UWB bandwidth of an imaging system operating under the provisions of this section must be contained between 3,100 MHz and 10,600 MHz.
- b) Operation under the provisions of this section is limited to medical imaging systems used at the direction of, or under the supervision of, a licensed health care practitioner. The operation of imaging systems under this section requires coordination, as detailed in §15.525.
- c) A medical imaging system shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. In lieu of a switch located on the imaging system, it is permissible to operate an imaging system by remote control provided the imaging system ceases transmission within 10 seconds of the remote switch being released by the operator."

7.4.6 Vehicular radar systems under CFR §15.515

Excerpt of [i.7]:

- a) *"Operation under the provisions of this section is limited to UWB field disturbance sensors mounted in terrestrial transportation vehicles. These devices shall operate only when the vehicle is operating, e.g., the engine is running. Operation shall occur only upon specific activation, such as upon starting the vehicle, changing gears, or engaging a turn signal.*
- b) *The UWB bandwidth of a vehicular radar system operating under the provisions of this section shall be contained between 22 GHz and 29 GHz. In addition, the centre frequency, f_c , and the frequency at which the highest level emission occurs, f_M , must be greater than 24.075 GHz.*
- c) *Following proper installation, vehicular radar systems shall attenuate any emissions within the 23.6-24.0 GHz band that appear 38 degrees or greater above the horizontal plane by 25 dB below the limit specified in paragraph (d) of this section. For equipment authorized, manufactured or imported on or after January 1, 2005, this level of attenuation shall be 25 dB for any emissions within the 23.6-24.0 GHz band that appear 30 degrees or greater above the horizontal plane. For equipment authorized, manufactured or imported on or after January 1, 2010, this level of attenuation shall be 30 dB for any emissions within the 23.6-24.0 GHz band that appear 30 degrees or greater above the horizontal plane. For equipment authorized, manufactured or imported on or after January 1, 2014, this level of attenuation shall be 35 dB for any emissions within the 23.6-24.0 GHz band that appear 30 degrees or greater above the horizontal plane. This level of attenuation can be achieved through the antenna directivity, through a reduction in output power or any other means."*

7.4.7 Indoor systems under CFR §15.517

Excerpt of [i.7]:

- a) *"Operation under the provisions of this section is limited to UWB transmitters employed solely for indoor operation.*
 1. *Indoor UWB devices, by the nature of their design, must be capable of operation only indoors. The necessity to operate with a fixed indoor infrastructure, e.g., a transmitter that must be connected to the AC power lines, may be considered sufficient to demonstrate this.*
 2. *The emissions from equipment operated under this section shall not be intentionally directed outside of the building in which the equipment is located, such as through a window or a doorway, to perform an outside function, such as the detection of persons about to enter a building.*
 3. *The use of outdoor mounted antennas, e.g., antennas mounted on the outside of a building or on a telephone pole, or any other outdoors infrastructure is prohibited.*
 4. *Field disturbance sensors installed inside of metal or underground storage tanks are considered to operate indoors provided the emissions are directed towards the ground.*
 5. *A communications system shall transmit only when the intentional radiator is sending information to an associated receiver.*
- b) *The UWB bandwidth of a UWB system operating under the provisions of this section must be contained between 3,100 MHz and 10,600 MHz.*
- c) *UWB systems operating under the provisions of this section shall bear the following or similar statement in a conspicuous location on the device or in the instruction manual supplied with the device:*

This equipment may only be operated indoors. Operation outdoors is in violation of 47 U.S.C. 301 and could subject the operator to serious legal penalties."

7.4.8 Handheld systems under CFR §15.519

Excerpt of [i.7]:

- a) *"UWB devices operating under the provisions of this section must be hand held, i.e., they are relatively small devices that are primarily hand held while being operated and do not employ a fixed infrastructure.*

- b) *A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.*
- c) *UWB devices operating under the provisions of this section may operate indoors or outdoors.*
- d) *The use of antennas mounted on outdoor structures, e.g., antennas mounted on the outside of a building or on a telephone pole, or any fixed outdoors infrastructure is prohibited. Antennas may be mounted only on the hand held UWB device."*

7.4.9 Wideband systems under CFR section §15.250

Section §15.250 of the CFR [i.7], while not specifically mentioning UWB systems deals with what are referred to as "Wideband Systems".

- a) *"The -10 dB bandwidth of a device operating under the provisions of this section must be contained within the 5,925-7,250 MHz band under all conditions of operation including the effects from stepped frequency, frequency hopping or other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.*
- b) *The -10 dB bandwidth of the fundamental emission shall be at least 50 MHz. For transmitters that employ frequency hopping, stepped frequency or similar modulation types, measurement of the -10 dB minimum bandwidth specified in this paragraph shall be made with the frequency hop or step function disabled and with the transmitter operating continuously at a fundamental frequency following the provisions of CFR §15.31(m).*
- c) *Operation on board an aircraft or a satellite is prohibited. Devices operating under this section may not be employed for the operation of toys. Except for operation on board a ship or a terrestrial transportation vehicle, the use of a fixed outdoor infrastructure is prohibited. A fixed infrastructure includes antennas mounted on outdoor structures, e.g., antennas mounted on the outside of a building or on a telephone pole."*

7.5 Limits

7.5.1 Ground penetrating radar & wall imaging systems under §15.509

Excerpt of [i.7]:

- a) *"The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209.*

Table 3: e.i.r.p. emission limits for ground penetrating radar & wall imaging systems under §15.209 - USA

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

- b) *The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.*

Table 15: e.i.r.p. emission limits for ground penetrating radar & wall imaging systems under §15.509 - USA

Frequency	Max. mean e.i.r.p. (dBm/MHz)
960 - 1,610 MHz	- 75.3
1.610 - 1,990 GHz	- 53.3
1.990 - 3.100 GHz	- 51.3
3.100 - 10.60 GHz	- 41.3
> 10.6 GHz	- 51.3

- c) In addition to the radiated emission limits specified in Table 15 above, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Table 16: Specific emission limits for ground penetrating radar & wall imaging systems under §15.509

Frequency	Max. mean e.i.r.p. (dBm/MHz)
1,164 - 1,240 MHz	- 75.3
1,559 - 1,610 MHz	- 73.3

- d) For UWB devices where the frequency at which the highest radiated emission occurs, f_M , is above 960 MHz, there is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centred on f_M . That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521."

7.5.2 Through-wall imaging systems under CFR §15.510

7.5.2.1 For through-wall imaging systems operating with the UWB bandwidth below 960 MHz

Excerpt of [i.7]:

- a) "The radiated emissions at or below 960 MHz shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Table 17: e.i.r.p. emission limits for ground penetrating radar & wall imaging systems under §15.209 - USA

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

- b) The radiated emissions above 960 MHz shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Table 18: Max mean emission limits for through-wall imaging systems under §15.510 - USA

Frequency	Max. mean e.i.r.p. (dBm/MHz)
960 - 1,610 MHz	- 65.3
1.610 - 1.990 GHz	- 53.3
> 1.990 GHz	- 51.3

- c) In addition to the radiated emission limits specified in the Table 18, emissions from these imaging systems shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Table 19: Specific emission limits for through-wall imaging systems under §15.510 - USA

Frequency	Max. mean e.i.r.p. (dBm/MHz)
1,164 - 1,240 MHz	- 75.3
1,559 - 1,610 MHz	- 73.3

7.5.2.2 For equipment operating with f_C and f_M between 1 990 MHz and 10 600 MHz

Excerpt of [i.7]:

- a) The radiated emissions at or below 960 MHz shall not exceed the emission levels in §15.209 of this chapter. The radiated emissions above 960 MHz shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Table 20: Max mean emission limits for through-wall imaging systems under §15.510 - USA

Frequency	Max. mean e.i.r.p. (dBm/MHz)
960 - 1 610 MHz	- 46.3
1.610 - 10.600 GHz	- 41.3
> 10.600 GHz	- 51.3

- b) In addition to the radiated emission limits specified in Table 20, emissions from these imaging systems shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Table 21: Specific emission limits for through-wall imaging systems under §15.510 - USA

Frequency	Max. mean e.i.r.p. (dBm/MHz)
1,164 - 1,240 MHz	- 56.3
1,559 - 1,610 MHz	- 56.3

- c) There is also a limit on the peak level of the emissions contained within a 50 MHz bandwidth centred on the frequency at which the highest radiated emission occurs, f_M . That limit is 0 dBm EIRP.

7.5.3 Surveillance systems under CFR §15.511

Excerpt of [i.7]:

- a) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Table 22: e.i.r.p. emission limits for surveillance systems §15.511 - USA

Frequency	Max. mean e.i.r.p. (dBm/MHz)
960 - 1,610 MHz	- 55.3
1.610 - 1.990 GHz	- 51.3
1.990 - 10.6 GHz	- 41.3
> 10.6 GHz	- 51.3

- b) In addition to the radiated emission limits specified in Table 22, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Table 23: Specific emission limits for surveillance systems under §15.511 - USA

Frequency	Max. mean e.i.r.p. (dBm/MHz)
1164 - 1240 MHz	- 63.3
1559 - 1610 MHz	- 63.3

- c) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centred on the frequency at which the highest radiated emission occurs, f_M . That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.

7.5.4 Medical imaging systems under CFR §15.513

Excerpt of [i.7]:

- a) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Table 24: e.i.r.p. emission limits for medical imaging systems under §15.513 - USA

Frequency	Max. mean e.i.r.p. (dBm/MHz)
960 - 1,610 MHz	- 65.3
1.610 - 1.990 GHz	- 53.3
1.990 - 3.100 GHz	- 51.3
3.100 - 10.60 GHz	- 41.3
> 10.6 GHz	- 51.3

- b) In addition to the radiated emission limits specified in Table 24, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Table 25: specific emission limits for medical imaging systems under §15.513 - USA

Frequency	Max. mean e.i.r.p. (dBm/MHz)
1,164 - 1,240 MHz	- 63.3
1,559 - 1,610 MHz	- 63.3

- c) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centred on the frequency at which the highest radiated emission occurs, f_M . That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.

7.5.5 Vehicular radar systems under CFR §15.515

Excerpt of [i.7]:

- a) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Table 26: e.i.r.p. emission limits for vehicular radar systems under §15.515 - USA

Frequency	Max. mean e.i.r.p. (dBm/MHz)
960 - 1,610 MHz	- 75.3
1,610 - 22.0 GHz	- 61.3
22.0 - 29.0 GHz	- 41.3
29.0 - 31.0 GHz	- 51.3
> 31.0 GHz	- 61.3

- b) In addition to the radiated emission limits specified in the table in paragraph (d) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Table 27: Specific emission limits for vehicular radar systems under §15.515 - USA

Frequency	Max. mean e.i.r.p. (dBm/MHz)
1,164 - 1,240 MHz	- 85.3
1,559 - 1,610 MHz	- 85.3

- c) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centred on the frequency at which the highest radiated emission occurs, f_M . That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.
- d) The emission levels from devices operating under the provisions of this section that employ gated transmissions may be measured with the gating active. Measurements made in this manner shall be repeated over multiple sweeps with the analyser set for maximum hold until the amplitude stabilizes.

7.5.6 Indoor systems under CFR §15.517

Excerpt of [i.7]:

- a) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in CFR 15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the average limits given in Table 28 when measured using a resolution bandwidth of 1 MHz:

Table 28: e.i.r.p. emission limits for indoor systems under §15.517 - USA

Frequency	Max. mean e.i.r.p. (dBm/MHz)	Max. Peak e.i.r.p. (dBm / 50MHz)
960 - 1,610 MHz	- 75.3	
1,610 - 1,990 GHz	- 53.3	
1,990 - 3,100 GHz	- 51.3	
3,100 - 10,60 GHz	- 41.3	0
> 10.6 GHz	- 51.3	

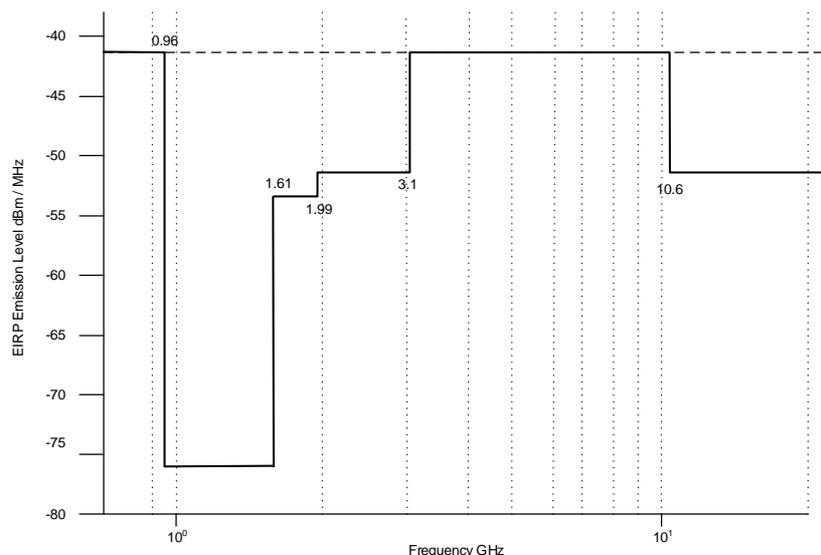


Figure 2: Max mean e.i.r.p emission limits for indoor systems under §15.517 - USA

- b) In addition to the radiated emission limits specified in Table 28, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz. There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centred on the frequency at which the highest radiated emission occurs, f_M . That limit is 0 dBm e.i.r.p. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in CFR 15.521.

Table 29: Specific emission limits for indoor systems under §15.517 - USA

Frequency	Max. mean e.i.r.p. (dBm/MHz)
1,164 - 1,240 MHz	- 85.3
1,559 - 1,610 MHz	- 85.3

7.5.7 Handheld systems under CFR §15.519

Excerpt of [i.7]:

- a) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the average limits given in Table 30 when measured using a resolution bandwidth of 1 MHz.

Table 30: e.i.r.p. emission limits for handheld systems under §15.519 - USA

Frequency	Max. mean e.i.r.p. (dBm/MHz)	Max. Peak e.i.r.p. (dBm / 50MHz)
960 - 1 610 MHz	- 75.3	
1.610 - 1.990 GHz	- 63.3	
1.990 - 3.100 GHz	- 61.3	
3.100 - 10.60 GHz	- 41.3	0
> 10.6 GHz	- 61.3	

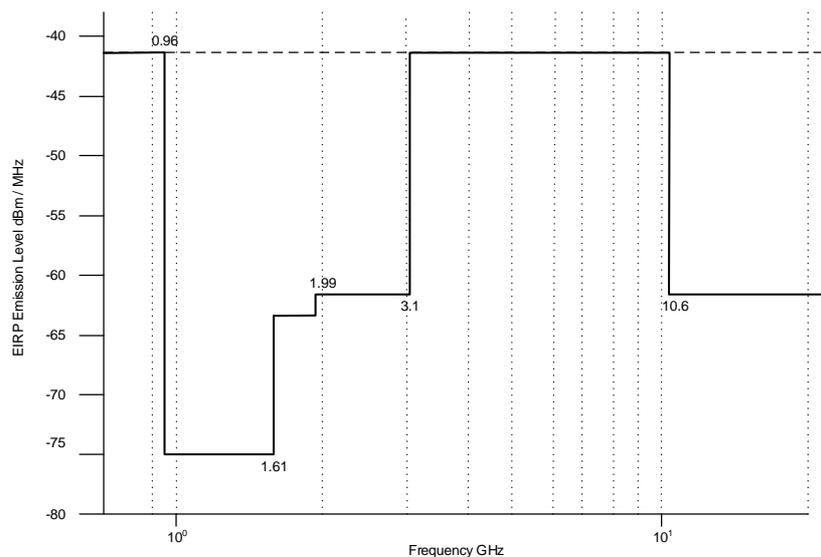


Figure 3: Max mean e.i.r.p for handheld systems under §15.519 - USA

- b) In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Table 31: Specific emission limits for handheld systems under §15.519 - USA

Frequency	Max. mean e.i.r.p. (dBm/MHz)
1,164 - 1,240 MHz	- 85.3
1,559 - 1,610 MHz	- 85.3

7.5.8 Wideband Systems under CFR §15.250

Table 32: e.i.r.p. emission limits for wideband systems under §15.250

Frequency	Max. mean e.i.r.p. (dBm/MHz)	Max. Peak e.i.r.p. (dBm / 50MHz)
960 - 1 610 MHz	- 75.3	
1.610 - 1.990 GHz	- 63.3	
1.990 - 3.100 GHz	- 61.3	
3.100 - 5.925 GHz	- 51.3	0
5.925 - 7.250 GHz	- 41.3	
7.250 -10.600 GHz	- 51.3	
> 10.6 GHz	- 61.3	

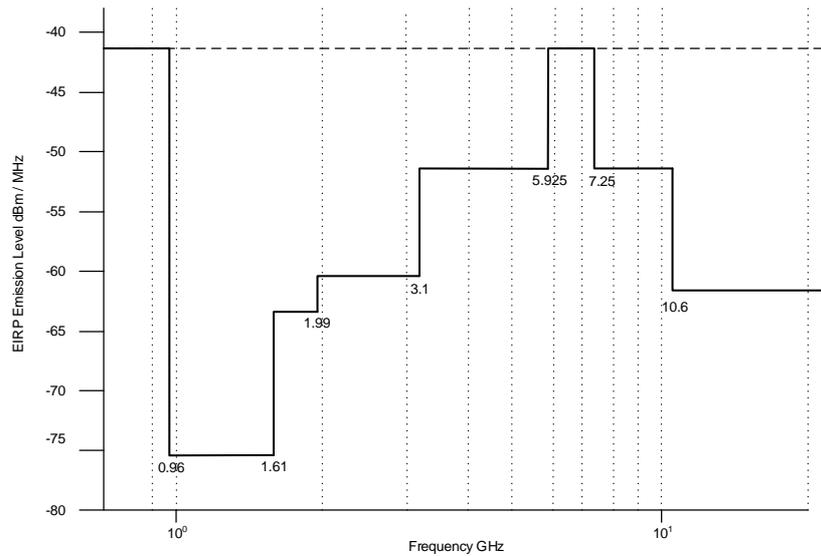


Figure 4: Max mean e.i.r.p. for wideband systems under §15.250 - USA

7.6 Mitigation Techniques

No specific mitigation techniques are mentioned.

7.7 FCC Waivers

The FCC has granted a number of waivers in relation to the use of UWB in the USA a sample of which are shown below.

Table 33: Sample FCC waivers

<i>Date</i>	<i>To whom granted</i>	<i>In relation to what</i>
Aug 12, 2015	iRobot Inc.	Section 15.250(c) of the wideband rules. Specifically waiving the prohibition on the use of fixed outdoor infrastructure to allow iRobot to obtain equipment certification for and market a robotic lawn mower ("RLM") that operates in the 6240-6740 MHz frequency range.
Jan 11, 2012	Curtiss-Wright Controls Inc.	Sections 15.503(d) and 15.521(d) of the ultra-wideband ("UWB") rules for its ground penetrating radar ("GPR") system, known as 3d-Radar.
May 23, 2011	Robert Bosch, GmbH	Section 15.503(h) for its Wallscanner D-TECT 150 Professional ("wallscanner") device and for functionally identical versions of that device.

8 Americas, North: Canada

8.1 Regulatory Authority

Industry Canada.

The rules are defined in RSS220 - Issue 1, March 2009 [i.6].

8.2 UWB Definition

Excerpt of [i.6]:

- a) *The transmit bandwidth (-10 dB) is at least 500 MHz or a fractional bandwidth greater than 0.2.*
- b) *The -10dB bandwidth shall be completely between 3.1 to 10.6 GHz.*

8.3 Applications

8.3.1 Indoor Communication Devices

Excerpt of [i.6]:

- a) *Indoor communications device: a device designed to transfer voice or data information, to detect the location of tags, or to serve as an underground field disturbance sensor.*
- b) *The -10 dB bandwidth of the device shall be totally contained in the band 3.1-10.6 GHz.*
- c) *The antenna of the UWB device shall be factory-installed and shall not be made modifiable by users.*
- d) *Indoor UWB communications devices, by the nature of their design, shall be capable of operation only indoors or in locations completely enclosed by walls and a ceiling. The necessity to operate within a fixed indoor infrastructure (e.g., a transmitter that must be connected to the AC power lines, an enclosure that is not weatherproof, etc.) may be considered sufficient to meet this requirement.*

8.3.2 Handheld Communication Devices

Excerpt of [i.6]:

- a) *Hand-held communications device: a device used to transfer voice or data information or designed to detect the location of tags.*
- b) *The -10 dB bandwidth of the device shall be totally contained in the band 3.1-10.6 GHz.*
- c) *The antenna of the UWB device shall be factory-installed and shall not be made modifiable by users.*
- d) *The device shall be designed so as to prevent its connection to antennas mounted on outdoor structures, e.g., antennas mounted on the outside of a building or on a telephone pole, or any fixed outdoors infrastructure.*
- e) *The device is to transmit only when it is sending information to an associated receiver. The device shall cease transmission of information within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB device at least every 10 seconds or the UWB device shall cease transmitting any information other than periodic signals used for the establishment or re-establishment of a communication link with an associated receiver.*

8.3.3 Ground penetrating radar

Excerpt of [i.6]:

- a) *Ground penetrating radar: a field disturbance sensor that operates when in contact with or within 1 m of the ground for the purpose of detecting or mapping subsurface structures. While primarily used for examining "underground," the term "ground" can be expanded to mean any lossy dielectric material. The energy from the GPR is intentionally directed down into the ground for this purpose.*
- b) *In addition to the labelling requirements of RSS-Gen, the GPR device user manual shall also contain the following statements or equivalent:*
 - "This Ground Penetrating Radar Device shall be operated only when in contact with or within 1 m of the ground.*
 - This Ground Penetrating Radar Device shall be operated only by law enforcement agencies, scientific research institutes, commercial mining companies, construction companies, and emergency rescue or firefighting organizations."*
- c) *UWB radar imaging devices may not be designed to detect tags or transfer data or voice information.*
- d) *The -10 dB UWB bandwidth for a GPR imaging device shall be entirely below 10.6 GHz.*
- e) *A device operating under the provisions of this section shall contain a mechanism that deactivates the equipment when normal use is interrupted. For manually operated hand-held devices, this mechanism shall contain a manual switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. In lieu of remotely / computer controlled equipment with a switch located on the radar imaging device, it is permissible to operate the device by a remote control unit provided that deactivation takes place within 10 seconds of the remote switch being released by the operator.*

8.3.4 In-wall radar imaging

Excerpt of [i.6]:

- a) *In-wall radar imaging device: a field disturbance sensor that is designed to examine and map the interior of walls. The walls are usually made of a concrete structure or similar dense, impermeable material that absorbs much of the impinging radio-wave energy. Typical walls include reinforced concrete building walls, retaining walls, tunnel liners, the walls of a mine, the sides of a bridge, or another physical structure that is dense enough and thick enough to dissipate and absorb most of the signal transmitted by the imaging device.*
- b) *In addition to the labelling requirements of RSS-Gen, the in-wall radar imaging device user manual shall also contain the following or equivalent statements:*
 - "This In-wall Radar Imaging Device shall be operated where the device is directed at the wall and in contact with or within 20 cm of the wall surface.*
 - This In-wall Radar Imaging Device shall be operated only by law enforcement agencies, scientific research institutes, commercial mining companies, construction companies, and emergency rescue or firefighting organizations."*
- c) *UWB radar imaging devices may not be designed to detect tags or transfer data or voice information.*
- d) *The -10 dB UWB bandwidth for an in-wall radar imaging device shall be entirely below 10.6 GHz.*
- e) *A device operating under the provisions of this section shall contain a mechanism that deactivates the equipment when normal use is interrupted. For manually operated hand-held devices, this mechanism shall contain a manual switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. In lieu of remotely / computer controlled equipment with a switch located on the radar imaging device, it is permissible to operate the device by a remote control unit provided that deactivation takes place within 10 seconds of the remote switch being released by the operator.*

8.3.5 Through-wall imaging

Excerpt of [i.6]:

- a) *Through-wall radar imaging device: a field disturbance sensor used to transmit energy through an opaque structure, such as a wall or a ceiling, to detect the movement or location of persons or objects that are located on the other side.*
- b) *In addition to the labelling requirements of RSS-Gen, the device user manual shall also contain the following statement or equivalent:*

"This Through-wall Radar Imaging Device shall be operated only by law enforcement agencies or emergency rescue or firefighting organizations that are under a local, provincial or federal authority. The equipment is to be operated only in providing services and for necessary training operations."
- c) *UWB radar imaging devices may not be designed to detect tags or transfer data or voice information.*
- d) *The -10 dB UWB bandwidth of a through-wall radar imaging device shall be totally contained either below 960 MHz or the centre frequency, f_C , and the frequency, at which the highest emission level occurs, f_M , shall be contained in the band 1.99-10.6 GHz.*

8.3.6 Radar surveillance

Excerpt of [i.6]:

- a) *Radar surveillance device: a field disturbance sensor used to establish a stationary radio frequency perimeter field that is used for security purposes to detect the intrusion of persons or objects.*
- b) *In addition to the labelling requirements of RSS-Gen, the device user manual shall also contain the following statement or equivalent:*

"This Radar Surveillance Device shall be installed in a manner that minimizes radiated emissions beyond the property line of the area under surveillance.

This Radar Surveillance Device shall be operated only by military, law enforcement, emergency rescue or firefighting organizations that are under a local, provincial or federal authority. The equipment is to be operated only in providing services and for necessary training operations."
- c) *UWB radar surveillance devices may not be designed to detect tags or transfer data or voice information.*
- d) *The -10 dB UWB bandwidth of a radar surveillance device shall be totally contained in the band 1.99-10.6 GHz.*

8.3.7 Medical radar imaging

Excerpt of [i.6]:

- a) *Medical radar imaging device: a field disturbance sensor used to detect the location or movement of objects inside the body of a human or an animal.*
- b) *In addition to the labelling requirements of RSS-Gen, the device user manual shall also contain the following statement or equivalent:*

"This Medical Radar Imaging Device shall be operated only in hospitals and health-care facilities, and only at the direction or under the supervision of a health-care practitioner."
- c) *UWB radar imaging devices may not be designed to detect tags or transfer data or voice information.*
- d) *The -10 dB UWB bandwidth of a medical radar imaging device shall be totally contained in the band 3.1-10.6 GHz.*

- e) A medical radar imaging device shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. It is permissible to operate an imaging device by remote control provided that the imaging device ceases transmission within 10 seconds of the remote switch being released by the operator.

8.4 Limits

8.4.1 Radiated emissions at or below 960 MHz

Excerpt of [i.6]:

Radiated emissions at or below 960 MHz for all subclasses of UWB device shall not exceed the limits in Table 5 below. A CISPR quasi-peak detector is used with the according bandwidth specifications. All UWB devices need to fulfil these requirements.

Table 5: e.i.r.p. emission limits below 960 MHz - Canada

Frequency (MHz)	Field Strength (Microvolts/m)	Measurement Distance (m)	e.i.r.p. (dBmW)
0.009-0.490	$2,400/F$ (F in kHz)	300	$10 \log (17.28 / F^2)$ (F in kHz)
0.490-1.705	$24,000/F$ (F in kHz)	30	$10 \log (17.28 / F^2)$ (F in kHz)
1.705-30	30	30	-45.7
30-88	100	3	-55.2
88-216	150	3	-51.7
216-960	200	3	-49.2

Note: The emission limits for the bands 9-90 kHz and 110 - 490 kHz are based on measurements employing an average emission detector.

8.4.2 Indoor Communication Devices

Excerpt of [i.6]:

- a) AC line-conducted emissions from the device shall comply with the limits for AC line-conducted emissions set out in RSS-Gen.
- b) Radiated emissions at or below 960 MHz from a device shall not exceed the limits in section 8.4.1.
- c) Radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

Table 35: e.i.r.p. emissions limits for indoor communication devices - Canada

Frequency	Max. mean EIRP (dBm/MHz)
960 - 1,610 MHz	- 75.3
1.61 - 4.75 GHz	- 70
4.75 - 10.6 GHz	- 41.3
> 10.6 GHz	- 51.3

- d) In addition to the limits specified in Table 35, radiated emissions shall not exceed the following average limits when measured using a resolution bandwidth greater than or equal to 1 kHz. The measurements shall demonstrate compliance with the stated limits at whatever resolution bandwidth is used.

Table 36: Specific emission limits for indoor communication devices - Canada

Frequency	Max. mean EIRP (dBm/MHz) in a resolution of 1 kHz
1,164 - 1,240 MHz	-85.3
1,559 - 1,610 MHz	-85.3

- e) Within the tables in paragraphs (c) and (d) above, the tighter emission limit applies at the band edges.
- f) The peak level of the transmissions shall not exceed the peak equivalent of the average limit contained within any 50 MHz bandwidth, as defined in section 4 of the Annex.

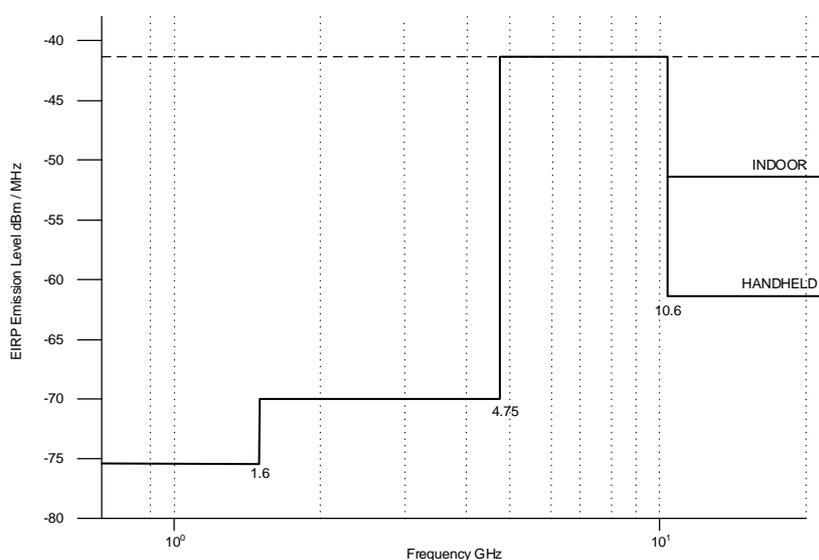
8.4.3 Handheld Communication Devices

Excerpt of [i.6]:

- a) Radiated emissions at or below 960 MHz from a device shall not exceed the limits in section 8.4.1.
- b) Radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

Table 37: e.i.r.p. emissions limits for handheld devices - Canada

Frequency	Max. mean EIRP (dBm/MHz)
960 - 1 610 MHz	- 75.3
1.61 - 4.75 GHz	- 70
4.75 - 10.6 GHz	- 41.3
> 10.6GHz	- 61.3

**Figure 5: Max mean e.i.r.p. limits for communication devices under RSS220**

- c) In addition to the limits specified in Table 6, radiated emissions shall not exceed the following average limits when measured using a resolution bandwidth greater than or equal to 1 kHz. The measurements shall demonstrate compliance with the stated limits at whatever resolution bandwidth is used.

Table 6: Specific e.i.r.p. emissions limits for handheld devices - Canada

Frequency	Max. mean EIRP (dBm/MHz) in a resolution of 1 kHz
1,164 - 1,240 MHz	- 85.3
1,559 - 1,610 MHz	- 85.3

- d) Within the tables in paragraphs (c) and (d) above, the tighter emission limit applies at the band edges.
- e) The peak level of the transmissions shall not exceed the peak equivalent of the average limit contained within any 50 MHz bandwidth, as defined in section 4 of the Annex.

8.4.4 Ground Penetrating Radar (GPR)

Excerpt of [i.6]:

- a) Radiated emissions at or below 960 MHz from a device shall not exceed the limits in section 8.4.1.
- b) Radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

Table 7: e.i.r.p. emissions limits for ground penetrating radar devices - Canada

Frequency	Max. mean EIRP (dBm/MHz)
960 - 1,610 MHz	- 65.3
1,610 - 1,990 MHz	- 53.3
1.99 - 3.10 GHz	-51.3
3.10 - 10.6 GHz	- 41.3
> 10.6 GHz	- 51.3

- c) In addition to the limits specified in paragraph (b) of this section, radiated emissions shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz. The measurements shall demonstrate compliance with the stated limits at whatever resolution bandwidth is used.

Table 40: Specific emission limits for ground penetrating radar devices - Canada

Frequency	Max. mean EIRP (dBm/MHz) in a resolution of 1 kHz
1,164 - 1,240 MHz	-75.3
1,559 - 1,610 MHz	-75.3

- d) Within the tables in paragraphs (b) and (c) above, the tighter emission limit applies at the band edges.
- e) The peak level of the transmissions shall not exceed the peak equivalent of the average limit contained within any 50 MHz bandwidth, as defined in section 4 of the Annex.

8.4.5 In-wall Imaging Radar

Excerpt of [i.6]:

- a) Radiated emissions at or below 960 MHz from a device shall not exceed the limits in section 8.4.1.
- b) Radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

Table 41: e.i.r.p. emissions limits for ground penetrating radar devices - Canada

Frequency	Max. mean EIRP (dBm/MHz)
960 - 1,610 MHz	- 65.3
1,610 - 1,990 MHz	- 53.3
1.99 - 3.10 GHz	-51.3
3.10 - 10.6 GHz	- 41.3
> 10.6 GHz	- 51.3

- c) In addition to the limits specified in paragraph (b) of this section, radiated emissions shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz. The measurements shall demonstrate compliance with the stated limits at whatever resolution bandwidth is used.

Table 42: Specific emission limits for ground penetrating radar devices - Canada

Frequency	Max. mean EIRP (dBm/MHz) in a resolution of 1 kHz
1,164 - 1,240 MHz	-75.3
1,559 - 1,610 MHz	-75.3

- d) Within the tables in paragraphs (c) and (d) above, the tighter emission limit applies at the band edges.
- e) The peak level of the transmissions shall not exceed the peak equivalent of the average limit contained within any 50 MHz bandwidth, as defined in section 4 of the Annex.

8.4.6 Through-wall Imaging Radar

Excerpt of [i.6]:

- a) Radiated emissions at or below 960 MHz from a device shall not exceed the limits in section 8.4.1.
- b) Radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

Table 43: e.i.r.p. emissions limits for through-wall imaging devices with -10 dB bandwidth = 960 MHz - Canada

Frequency	Max. mean EIRP (dBm/MHz)
960 - 1 610 MHz	- 65.3
1.61 - 1.99 GHz	- 53.3
> 1.99 GHz	- 51.3

Table 44: e.i.r.p. emissions limits for through-wall imaging devices with fC & fM between 1.99 & 10.6 GHz - Canada

Frequency	Max. mean EIRP (dBm/MHz)
960 - 1 610 MHz	- 46.3
1.61 - 10.6 GHz	- 41.3
> 10.6 GHz	- 51.3

- c) In addition to the limits specified in paragraph (b) of this section, radiated emissions shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz. The measurements shall demonstrate compliance with the stated limits at whatever resolution bandwidth is used.

Table 45: Specific emission limits for through-wall imaging devices with -10 dB bandwidth = 960 MHz - Canada

Frequency	Max. mean EIRP (dBm/MHz) in a resolution of 1 kHz
1,164 - 1,240 MHz	-75.3
1,559 - 1,610 MHz	-75.3

Table 46: Specific emission limits for through-wall imaging devices with fC & fM between 1.99 & 10.6 GHz - Canada

Frequency	Max. mean EIRP (dBm/MHz) in a resolution of 1 kHz
1,164 - 1,240 MHz	-56.3
1,559 - 1,610 MHz	-56.3

- d) Within the tables in paragraphs (b) and (c) above, the tighter emission limit applies at the band edges.
- e) The peak level of the transmissions shall not exceed the peak equivalent of the average limit contained within any 50 MHz bandwidth, as defined in section 4 of the Annex.

8.4.7 Radar Surveillance Devices

Excerpt of [i.6]:

- a) Radiated emissions at or below 960 MHz from a device shall not exceed the limits in section 8.4.1.
- b) Radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

Table 47: e.i.r.p. emissions limits for radar surveillance devices - Canada

Frequency	Max. mean EIRP (dBm/MHz)
960 - 1,610 MHz	- 53.3
1,610 - 1,990 MHz	- 51.3
1.99 - 10.6 GHz	-41.3
> 10.6 GHz	- 51.3

- c) In addition to the limits specified in paragraph (b) of this section, radiated emissions shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz. The measurements shall demonstrate compliance with the stated limits at whatever resolution bandwidth is used.

Table 48: Specific emission limits for radar surveillance devices - Canada

Frequency	Max. mean EIRP (dBm/MHz) in a resolution of 1 kHz
1,164 - 1,240 MHz	-63.3
1,559 - 1,610 MHz	-63.3

- d) Within the tables in paragraphs (b) and (c) above, the tighter emission limit applies at the band edges.
- e) The peak level of the transmissions shall not exceed the peak equivalent of the average limit contained within any 50 MHz bandwidth, as defined in section 4 of the Annex.

8.4.8 Medical Radar Imaging Devices

Excerpt of [i.6]:

- a) Radiated emissions at or below 960 MHz from a device shall not exceed the limits in section 8.4.1.
- b) Radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

Table 49: e.i.r.p. emissions limits for medical radar imaging devices - Canada

Frequency	Max. mean EIRP (dBm/MHz)
960 - 1,610 MHz	- 65.3
1,610 - 1,990 MHz	- 53.3
1.99 - 3.10 GHz	-51.3
3.10 - 10.6 GHz	- 41.3
> 10.6 GHz	- 51.3

- c) In addition to the limits specified in paragraph (b) of this section, radiated emissions shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz. The measurements shall demonstrate compliance with the stated limits at whatever resolution bandwidth is used.

Table 50: Specific emission limits for medical radar imaging devices - Canada

Frequency	Max. mean EIRP (dBm/MHz) in a resolution of 1 kHz
1,164 - 1,240 MHz	-75.3
1,559 - 1,610 MHz	-75.3

- d) *Within the tables in paragraphs (b) and (c) above, the tighter emission limit applies at the band edges.*
- e) *The peak level of the transmissions shall not exceed the peak equivalent of the average limit contained within any 50 MHz bandwidth, as defined in section 4 of the Annex.*

8.5 Mitigation Techniques

None.

8.6 Measurement Techniques

Measurement techniques are defined in the annex to the regulations.

9 Asia: Australia

9.1 Regulatory Authority

Australian Communications and Media Authority (ACMA).

Rules are defined in [i.9].

9.2 UWB Definition

Refers to ETSI rules.

9.3 Applications

- Communications.
- Short range vehicle radar.

9.4 Requirements

Excerpt of [i.9]:

The following limitations are specified:

1. *UWB transmitter must operate within the frequency range 6 - 8.4 GHz.*
2. *A transmitter mentioned in this item must comply with either ETSI Standard ETSI EN 302 500 or ETSI Standard ETSI EN 302 065.*
3. *Must not be operated on board any aircraft or from any fixed outdoor location.*
4. *Must not be operated within a nominated distance of a specified Australian radio astronomy site.*

Nominated distance of a specified Australian radio astronomy site is defined as follows:

1. *Within 10 km of Parkes Observatory located near Parkes (Latitude 32o 59' 59.8657" S Longitude 148o 15' 44.3591" E); or*
2. *Within 10 km of Paul Wild Observatory located near Narrabri (Latitude 30o 18' 52.048" S Longitude 149o 32' 56.327" E); or*
3. *Within 3 km of the Canberra Deep Space Communications Complex (Latitude 35o 23' 54"S Longitude 148o 58' 40" E); or*

4. Within 10 km of the Radio Astronomy Park in Western Australia (Latitude 26° 37' 13.4" S Longitude 117° 30' 40" E).

9.5 Limits

Table 51: Max mean e.i.r.p. emission limits - Australia [i.9]

Frequency	Max. mean e.i.r.p. (dBm/MHz), Effective value RMS
< 1.6 GHz	- 90
1.6 - 3.6GHz	- 85
3.6 - 6 GHz (Note 1)	- 70
6.0 - 9.0 GHz	- 41
- 10.6 GHz	- 70
> 10.6 GHz	- 90

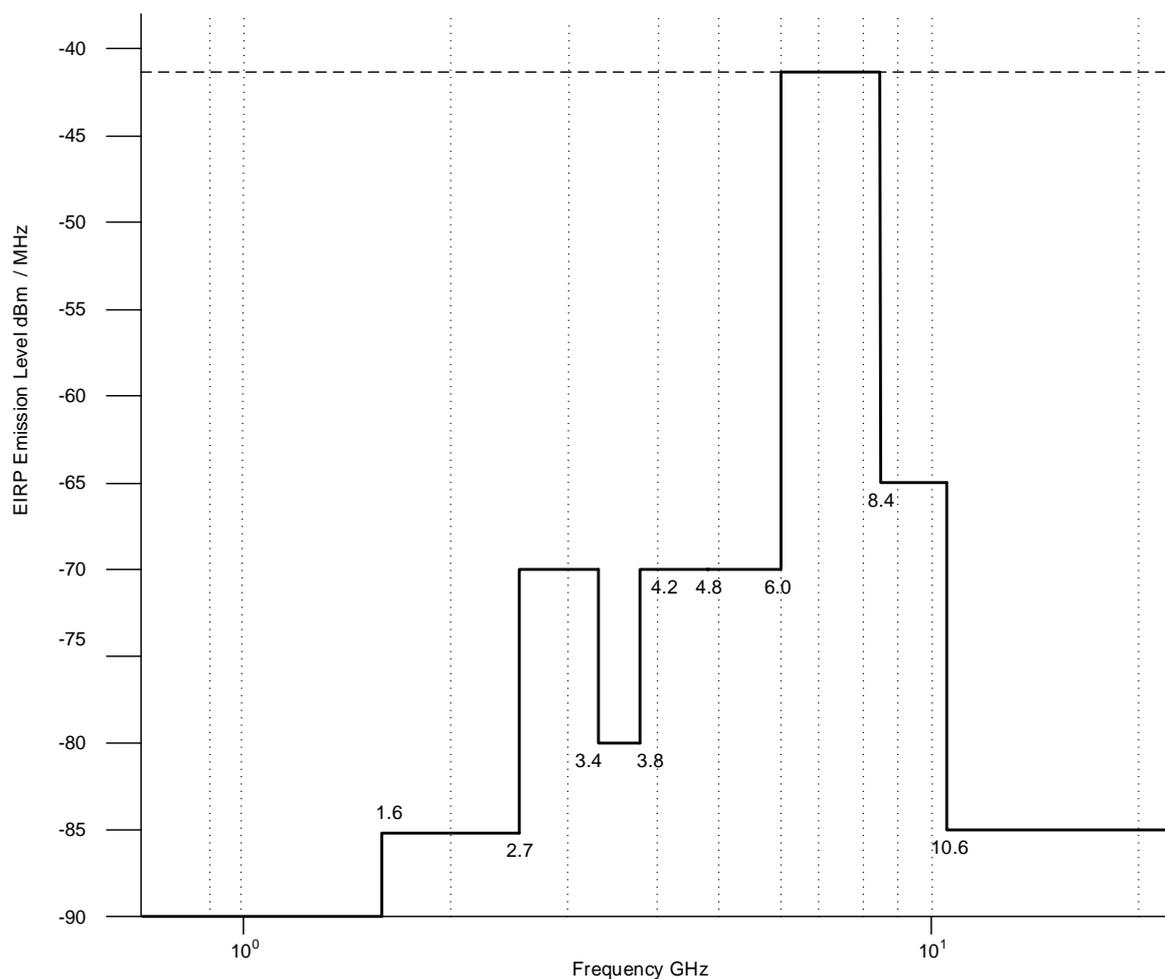


Figure 6a: Max mean e.i.r.p. emission limits - Australia [i.9]

9.6 Mitigation Techniques

Refers to ETSI standards.

10 Asia: China

10.1 Regulatory Authority

Ministry of Industry and Information Technology (MIIT).

Regulations are defined in [i.10].

10.2 UWB Definition

Excerpt of [i.10]:

The device's transmit signal bandwidth (-10dB) should be at least 500 MHz.

10.3 Applications

Not stated.

10.4 Requirements

Excerpt of [i.10]:

- *UWB devices should follow the regulations of micro-power (short range) wireless transmit devices and a certificate from MIIT is compulsory.*
- *UWB radio transmitting devices shall not cause radio interference to other radio stations, and shall not request interference protection from other radio stations.*
- *The transmission of UWB radio devices is prohibited to be used 1 kilometre around the Radio Astronomy Stations, listed by "the wireless frequency regulations in P.R.China" note "CHN12".*
- *UWB is prohibited on board of aircraft.*

10.5 Limits

Table 8: Max mean e.i.r.p. emission limits - China [i.10]

Frequency	Max. e.i.r.p. (dBm/MHz), Effective value RMS
< 1.6 GHz	- 90
1.6 - 3.6GHz	- 85
3.6 - 6 GHz (Note 1)	- 70
6.0 - 9.0 GHz	- 41
- 10.6 GHz	- 70
> 10.6 GHz	- 90

Note 1: In the 4.2 to 4.8 GHz band, if mitigation techniques are implemented, then a max. EIRP limit of -41 dBm/MHz applies.

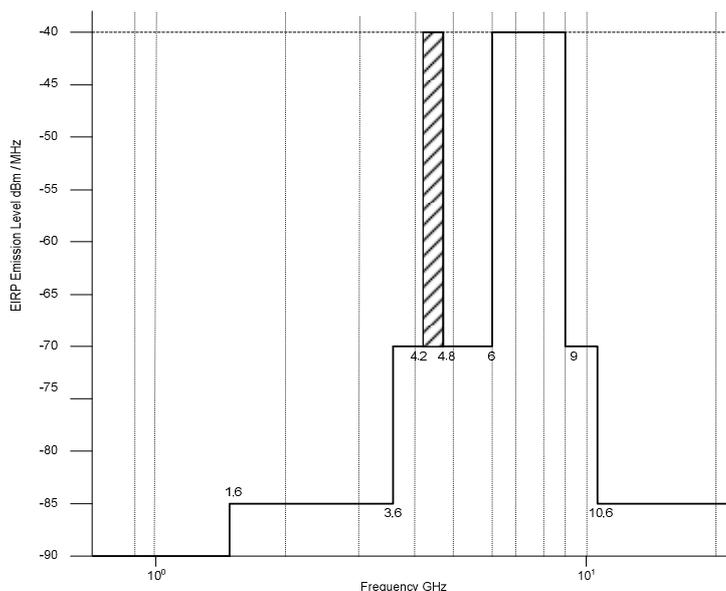


Figure 6b: Max mean e.i.r.p limits - China

Table 53: Narrowband spurious emissions of UWB radio transmitting devices - China [i.10]

Frequency	Resolution Bandwidth	Operating (dBm)	Stand-By (dBm)
48.5 - 72.5 MHz, 76 - 108 MHz, 167 - 223 MHz, 470 - 798 MHz	100 kHz	- 54	- 57
30 MHz - 1 GHz	100 kHz	- 36	- 47
1 GHz - 40 GHz	1 MHz	- 30	- 47

10.6 Mitigation Techniques

Any mitigation technologies employed require approval by the Agency of Radio Management of the Peoples' Republic of China.

11 Asia: Japan

11.1 Regulatory Authority

The UWB rules are defined in ARIB STD-T91 [i.11].

11.2 UWB Definition

Excerpt of [i.11]:

"Device transmit bandwidth (-10 dB) is at least 450 MHz."

11.3 Applications

- ARIB focus on systems with an antenna input power of < 0,001 W.
- Restricted to indoor use.

11.4 Requirements

Excerpt of [i.11]:

- "Tolerance of antenna power shall be less than allowed maximum + 20%.
- For operation in the 3.4 to 4.8 GHz band, the data rate used must be higher than 50 Mbps. No such restriction is placed on the 7.25 to 10.6 GHz band."

11.5 Limits

Table 54: Wanted e.i.r.p emission limits - Japan [i.11]

<i>Frequency</i>	<i>Max. mean EIRP (dBm/MHz)</i>	<i>Max. Peak e.i.r.p. (dBm / 50MHz)</i>
3.4 - 4.8 GHz (Note1)	- 41.3	0
7.25 - 10.6 GHz	- 41.3	0

Note1: with Mitigation Techniques

Table 9: Unwanted e.i.r.p emission limits - Japan [i.11]

<i>Frequency</i>	<i>Max. mean EIRP (dBm/MHz)</i>	<i>Max. Peak e.i.r.p. (dBm / 50MHz)</i>
< 1 600 MHz	- 90	- 84
1.6 - 2.7 GHz	- 85	- 79
2.7 - 10.6 GHz	- 70	- 64
10.6 - 10.7 GHz	- 85	- 79
10.7 - 11.7 GHz	- 70	- 64
11.7 - 12.75 GHz	- 85	- 79
> 12.75 GHz	- 70	- 64

Table 56: Receiver Emissions - Japan [i.11]

<i>Frequency</i>	<i>Mean power limit (dBm/MHz) if 3.4 to 4.8 GHz band used.</i>	<i>Mean power limit (dBm/MHz) if 7.25 to 10.25 GHz band used.</i>
< 1 600 MHz	- 90	- 90
1.6 - 2.7 GHz	- 85	- 85
2.7 - 3.4 GHz	- 70	- 70
3.4 - 4.8 GHz	- 54	- 70
4.8 - 7.25 GHz	- 70	- 70
7.25 - 10.25 GHz	- 70	- 54
10.25 - 10.6 GHz	- 70	- 70
10.6 - 10.7 GHz	- 85	- 85
10.7 - 11.7 GHz	- 70	- 70
11.7 - 12.75 GHz	- 85	- 85
> 12.75 GHz	- 70	- 70

11.6 Mitigation Techniques

Only Detect and Avoid (DAA) is permitted as a mitigation technique. LDC is not permitted.

12 Asia: Korea

12.1 Regulatory Authority

Korean Communications Commission (KCC).

The Korean rules are defined in [i.12].

12.2 UWB Definition

Excerpt of [i.12]:

Device transmit bandwidth (-10 dB) is at least 450 MHz.

12.3 Applications

- Use in model airplanes, aircraft, ships and satellites is prohibited.

12.4 Requirements

- Point to point communication needs to be implemented.
- Fixed devices are not permitted.

12.5 Limits

Table 57: e.i.r.p. emission limits - Korea [i.12]

<i>Frequency</i>	<i>Max. mean EIRP (dBm/MHz)</i>	<i>Max. Peak e.i.r.p. (dBm / 50MHz)</i>
<i>< 1.6 GHz</i>	<i>- 90</i>	
<i>1.6 - 2.7 GHz</i>	<i>- 85</i>	
<i>2.7 - 3.1 GHz</i>	<i>- 70</i>	
<i>3.1 - 4.2 GHz (Note 1)</i>	<i>- 41.3</i>	<i>0</i>
<i>4.2 - 4.8 GHz (Note 1)</i>	<i>- 41.3</i>	<i>0</i>
<i>4.8 - 7.2 GHz</i>	<i>- 70</i>	
<i>7.2 - 10.2 GHz</i>	<i>- 41.3</i>	
<i>> 10.2 GHz</i>	<i>- 70</i>	

12.6 Mitigation Techniques

Excerpt of [i.12]:

Note 1: Korea requires use of Detect and Avoid (DAA) technology for UWB devices operating in the 3.1 to 4.2 GHz band from April 2007, and for those operating in the 4.2 to 4.8 GHz band from January 2017. Without DAA in the 3.1 - 4.8 GHz band, emission power is limited to -70 dBm/MHz or less.

13 Asia: Malaysia

13.1 Regulatory authority

Regulatory authority: Communications and Multimedia Commission.

Rules are defined in SKMM SRSP-549 UWB [i.13].

13.2 UWB Definition

13.3 Applications

Excerpt of [i.13]:

A UWB communications device is a short range communication device using UWB technology to transmit and/or receive information between devices.

An automotive radar device is a radar device using UWB technology mounted on land transportation vehicles to detect the location and/or movement of persons or objects near the vehicle.

A Radar imaging device is a device using UWB technology used to obtain images of obstructed objects. This includes in-wall and through-wall detection, ground penetrating radar, medical imaging and surveillance devices.

13.4 Requirements

13.4.1 General

Excerpt out of [i.13]:

"Devices using UWB technology shall be tested for compliance with the technical requirements, following the appropriate techniques for measuring UWB transmissions given in ETSI EN 302 065 [i.18], ETSI EN 302 066-1 [i.4] or ITU-R SM.1754 [i.19]".

The operation of devices using UWB technology on aircraft, ship or satellite is not permissible.

Devices using UWB technology shall not cause harmful interference to primary radio communication services operating in the said bands, operate on a non-interference basis and cannot claim protection from these radio communication services".

13.4.2 Communication Devices

Excerpt of [i.13]:

- *UWB communication device which operates in the frequency band of 3.1 GHz to 10.6 GHz shall only be utilized for communication purposes and shall only be used in confined areas of buildings or localized on-site operations. The use of outdoor mounted antennae is not permissible.*
- *The emission of UWB communication device shall not be intentionally directed outside of the building in which the device is being used.*
- *The transmission of UWB communication devices shall only be permitted when it is in communication with an intended receiver. The device shall cease transmission unless it receives acknowledgment from the intended receiver.*
- *The operation of UWB communication device is not permissible to:*
- *Devices and/or antenna used or connected at outdoor location.*

- *Devices installed in flying models, aircraft or other aviation.*
- *Devices installed in road and rail vehicles.*

13.4.3 Automotive radar devices

Excerpt of [i.13]:

UWB automotive radar device which operates in the frequency bands of 21.65 GHz to 29.5 GHz and/or 77 GHz to 81 GHz shall be permitted for land transportation only.

The operation of UWB automotive radar device shall only be activated when the land transportation or vehicle is operating.

13.4.4 Imaging Devices

Excerpt of [i.13]:

- *The use of UWB radar imaging device shall be contained within the frequency bands of 30 MHz to 960 MHz and/or 2.17 GHz to 10.6 GHz.*
- *The UWB radar imaging device shall not be used for communication purposes where the radiation into free space is not permissible.*
- *The UWB radar imaging device shall have a deactivation mechanism to deactivate the device when it is interrupted in normal use. This mechanism shall fulfil the following requirements.*
- *Contain a manually operated non-locking switch which ensures that the UWB radar imaging device deactivates (i.e. the transmitter switches off) within 10 seconds of the control system being switched off; and*
- *In the case of remotely/computer controlled imaging equipment, the UWB radar imaging device is deactivated via the control system provided that deactivation takes place within 10 seconds of the control system being switched off.*
- *The UWB ground probing radar device, in-wall probing radar device and through-wall probing radar device shall operate only when in contact with, or within close proximity of the ground or the wall and the emission from these devices shall intentionally be directed towards ground or wall for the purpose of detecting or obtaining the images of objects.*

13.5 Limits

13.5.1 Communication devices

Excerpt of [i.13]:

UWB communication devices shall operate in the frequency band of 3.1 GHz to 10.6 GHz. The permitted maximum mean and maximum peak e.i.r.p. emission limits for such devices are given in Table 13 below:

Table 13: e.i.r.p. emission limits for communications devices - Malaysia [i.13]

Frequency	Max. mean e.i.r.p. (dBm/MHz), Effective value RMS	Max. peak e.i.r.p. (dBm/MHz), Effective value RMS
<i>3.1 - 3.4 GHz</i>	<i>- 70</i>	<i>- 36</i>
<i>3.4 - 3.8 GHz (Note 1)</i>	<i>- 80</i>	<i>- 40</i>
<i>3.8 - 6.0 GHz</i>	<i>- 70</i>	<i>- 36</i>
<i>6.0 - 8.5 GHz</i>	<i>-41.3</i>	<i>0</i>
<i>8.5 - 10.6 GHz</i>	<i>- 65</i>	<i>- 25</i>

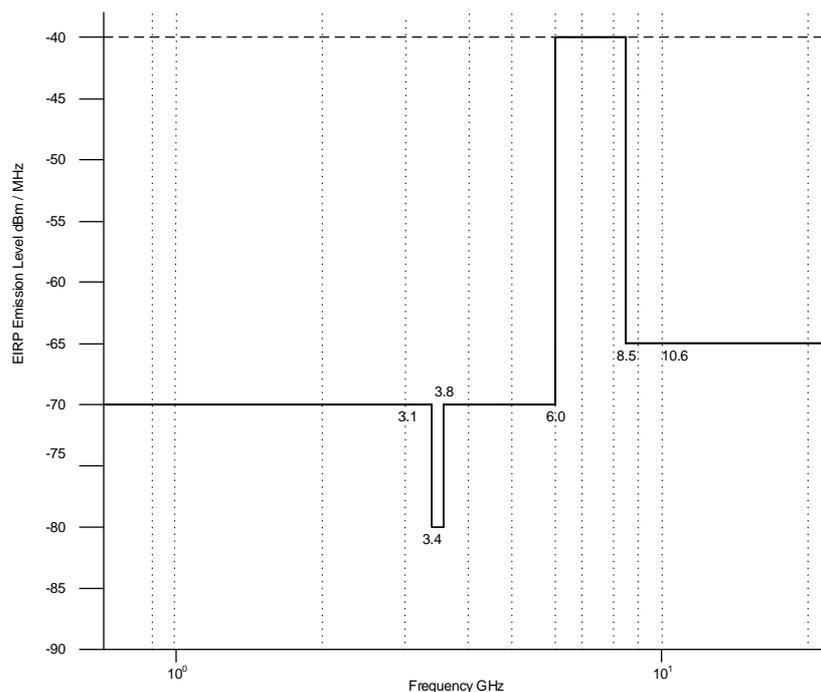


Figure 7: Max mean e.i.r.p. emission limits - communication devices - Malaysia

13.5.2 Automotive radar devices

Excerpt of [i.13]:

UWB automotive radar devices shall operate in the frequency bands of 21.65 GHz to 29.5 GHz and/or 77 GHz to 81 GHz. The permitted maximum mean and maximum peak e.i.r.p. emission limits for such devices are given in table 59 below:

Table 59: e.i.r.p. emission limits for automotive radar devices - Malaysia [i.13]

Frequency	Max. mean e.i.r.p. (dBm/MHz), Effective value RMS	Max. peak e.i.r.p. (dBm/MHz), Effective value RMS
21.65 - 22 GHz	- 61.3	- 0
22 - 29.5 GHz	- 41.3	- 0
77 - 81 GHz	- 3	- 55

The emissions within the 23.6 GHz to 24 GHz frequency band that appear 30° or greater above the horizontal plane shall be attenuated by at least 35 dB. The level of attenuation can be achieved through antenna directivity, reduction of output power or any other means.

For the frequency band of 24.00 GHz to 24.25 GHz, narrow band emission with a maximum peak EIRP of 30 dBm is allowed.

13.5.3 Ground, in-wall & through-wall probing devices

Excerpt of [i.13]:

The permitted maximum mean and maximum peak e.i.r.p emission limits for ground probing radar devices, in-wall probing radar devices, and through-wall probing radar devices is given in Table 60 below:

Table 60: e.i.r.p. emission limits for ground, in-wall & through-wall devices - Malaysia [i.13]

<i>Frequency</i>	<i>Max. mean e.i.r.p. (dBm/MHz), Effective value RMS</i>	<i>Max. peak e.i.r.p. (dBm/MHz), Effective value RMS</i>
3.1 - 3.4 GHz	- 70	- 36
3.4 - 3.8 GHz (Note 1)	- 80	- 40
3.8 - 6.0 GHz	- 70	- 36
6.0 - 8.5 GHz	-41.3	0
8.5 - 10.6 GHz	- 65	- 25

The permitted maximum mean e.i.r.p emission limits for the use of medical imaging device and surveillance device are given in Table 61.

Table 61: e.i.r.p. emission limits for medical imaging devices - Malaysia [i.13]

<i>Frequency</i>	<i>Max. mean e.i.r.p. (dBm/MHz), Effective value RMS</i>	<i>Max. peak e.i.r.p. (dBm/ 50 MHz), Effective value RMS</i>
2.17 - 10.6 GHz	- 41.3	- 30

13.6 Mitigation Techniques

Excerpt of [i.13]:

The following mitigation techniques are listed:

- *Detect and avoid (DAA) technology: the device detects the presence of signals from other radio systems and reduces its transmitted power down to a level where it does not cause interference to these systems;*
- *Low Duty Cycle (LDC) technique: the device operates by lowering the pulse repetition interval or pulse occupation time; and/or*
- *Any other mitigation techniques as stipulated in the ITU-R SM.1757 [i.20] document.*

14 Asia: New Zealand

14.1 Regulatory Authority

Commerce Commission of New Zealand (ComCom).

The rules can be found in New Zealand Gazette, 31/7/2008 [i.14].

14.2 UWB Definition

Excerpt of [i.14]:

Device transmit bandwidth (-10 dB) is at least 500 MHz or a fractional bandwidth of greater than 0.2.

14.3 Applications

- UWB is prohibited on board of aircrafts.
- Fixed outdoor transmitter or antenna is prohibited.

14.4 Requirements

- A general user radio licence is granted for transmitting devices conforming to the rules.

14.5 Limits

Table 13: e.i.r.p. emission limits - New Zealand [i.14]

<i>Frequency</i>	<i>Max. e.i.r.p. (dBm/MHz)</i>	<i>Max. Peak e.i.r.p. (dBm / 50MHz)</i>
<i>< 1.6 GHz</i>	<i>- 90</i>	<i>- 50</i>
<i>1.6 - 2.7 GHz</i>	<i>- 85</i>	<i>- 45</i>
<i>2.7 - 3.4 GHz</i>	<i>- 70</i>	<i>- 36</i>
<i>3.4 - 3.8 GHz (Note 1)</i>	<i>- 80</i>	<i>- 40</i>
<i>3.8 - 4.2 GHz (Note 1)</i>	<i>- 70</i>	<i>- 30</i>
<i>4.2 - 4.8 GHz (Note 1, 2, 3)</i>	<i>- 70</i>	<i>- 30</i>
<i>4.8 - 6 GHz</i>	<i>- 70</i>	<i>- 30</i>
<i>6 - 8.5 GHz (Note 2, 3)</i>	<i>- 41.3</i>	<i>0</i>
<i>8.5 - 10.6 GHz</i>	<i>- 65</i>	<i>- 25</i>
<i>> 10.6 GHz</i>	<i>- 85</i>	<i>- 45</i>

Excerpt of [i.14]:

Note 1: *If Low Duty Cycle (LDC) is implemented a maximum mean e.i.r.p. spectral density of -41.3dBm / MHz and a maximum peak e.i.r.p. of 0 dBm applies.*

Note 2: *If the devices are installed in road and rail vehicles, where transmit power control is implemented a maximum mean e.i.r.p. spectral density is -41.3 dBm / MHz and a maximum peak e.i.r.p. of 0 dBm applies and a transmit power control must operate with a range of 12 dB below the maximum mean e.i.r.p. spectral density.*

Note 3: *If the devices are installed in road and rail vehicles, where transmit power control is not implemented a maximum mean e.i.r.p. of -53.3dBm / MHz and the maximum peak e.i.r.p. of -12 dBm is defined.*

15 Asia: Singapore

15.1 Regulatory authority

Info-Communications Development Authority of Singapore (IDA).

The Singaporean UWB rules are defined in [i.15].

15.2 UWB Definition

Excerpt of [i.15]:

Devices using UWB technology have intentional radiation from the antenna with either a -10 dB bandwidth of at least 500 MHz or a -10 dB fractional bandwidth greater than 0.2.

15.3 Applications

- A UWB imaging system with peak transmission below 960 MHz or in the 3,4 to 10,6 GHz band are approved on an exceptional basis.
- Point to point communication needs to be applied.

15.4 Requirements

15.4.1 Generic requirements

Excerpt of [i.15]:

- a) Provisions given in Figure 1 and Table 1 of this Specification are not applicable to outdoor installations and infrastructure, including those with externally mounted antennas. UWB devices used outdoors shall not be operating from a fixed outdoor location or antenna.*
- b) UWB devices shall not cause harmful interference to radio-communication services operating in allocated frequency bands, and cannot claim protection from these radio-communication services;*
- c) UWB devices should be capable of implementing mitigation techniques to provide additional protection to radio-communication services;*
- d) UWB devices shall be fixed with integral antenna and without the antenna connector;*
- e) The UWB device shall not be constructed with any external or readily accessible control which permits the adjustment of its operation in a manner that is inconsistent with this Specification;*
- f) The UWB device shall be marked with the supplier/manufacturer's name or identification mark, and the supplier/manufacturer's model or type reference. The markings shall be legible, indelible and readily visible.*

15.4.2 Communications Systems

Excerpt of [i.15]:

- a) If the UWB device is operating as a communication system, it shall transmit only when it is sending information to an associated receiver. The UWB device shall cease transmission within 10 seconds unless it receives acknowledgment from the associated receiver. The UWB device must continue to receive an acknowledgement of transmission at least every 10 seconds else it must cease transmitting.*

15.4.3 Radar / Imaging systems

Excerpt of [i.15]:

- a) *If the UWB device is operating as a non-communication system such as an imaging system, it shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by Generic UWB Devices.*
- b) *It is also permissible to operate an imaging system by remote control provided the imaging system ceases transmission within 10 seconds of the remote switch being released by the operator.*
- c) *GPR and WPR imaging systems shall be designed to operate while in contact with or close to the ground or wall, with their emissions being directed into the ground / wall.*

15.5 Limits

15.5.1 Communications Systems

The references for these regulations are ETSI EN 302 065 [i.18] and ECC Decision (06)04 amended 6 July 2007 [i.23].

Table 63: e.i.r.p. emission limits for communication devices - Singapore [i.15]

<i>Frequency</i>	<i>Max e.i.r.p. (dBm/MHz)</i>	<i>Max. Peak e.i.r.p. (dBm / 50MHz)</i>
<i>< 1.6 GHz</i>	<i>- 90</i>	<i>- 50</i>
<i>1.6 - 2.7 GHz</i>	<i>- 85</i>	<i>- 45</i>
<i>2.7 - 3.4 GHz</i>	<i>- 70</i>	<i>- 36</i>
<i>3.4 - 4.2 GHz (Note 1)</i>	<i>- 70</i>	<i>- 30</i>
<i>4.2 - 4.8 GHz (Note 2)</i>	<i>- 41.3</i>	<i>0</i>
<i>4.8 - 6 GHz</i>	<i>- 70</i>	<i>- 30</i>
<i>6 - 8.5 GHz (Note 3)</i>	<i>- 41.3</i>	<i>0</i>
<i>8.5 - 10.6 GHz</i>	<i>- 65</i>	<i>- 25</i>
<i>> 10.6 GHz</i>	<i>- 85</i>	<i>- 45</i>

Excerpt of [i.15]:

Note 1: *If appropriate mitigation techniques are implemented, then a mean spectral density of -41.3dBm/MHz and a peak spectral density of 0 dBm /50MHz applies.*

Note 2: *Conditions in the 4.2 to 4.8 GHz band for equipment using UWB technology without appropriate mitigation techniques should be time-limited and be replaced by more restrictive conditions beyond 31 December 2010 (ECC/DEC/(06)04 Amended 6 July 2007).*

Note 3: *The extension of this band from 6 to 9 GHz is also acceptable in the light of new applications.*

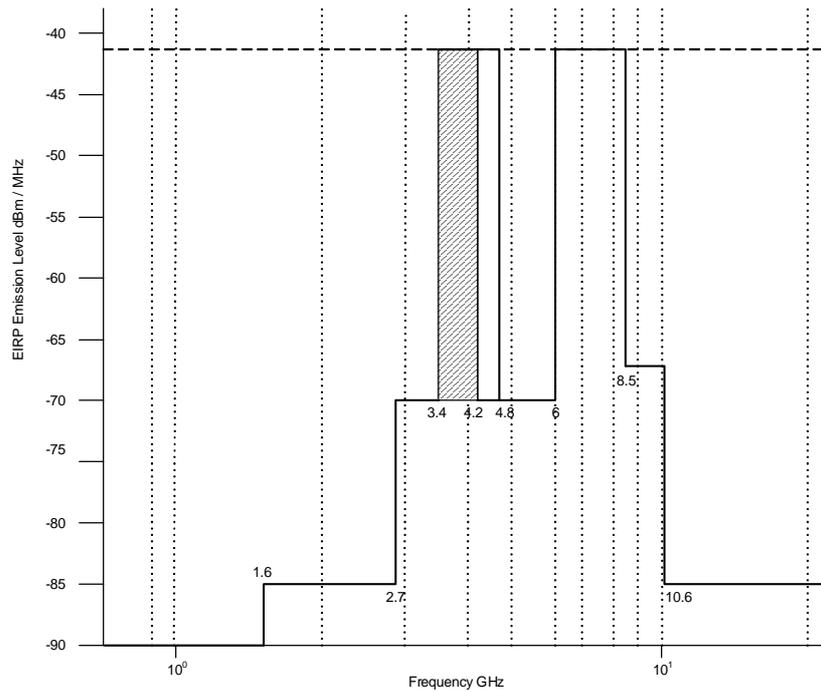


Figure 8: Max mean e.i.r.p. limits for communication devices - Singapore

15.5.2 Radar/Imaging systems

Table 14: e.i.r.p. emission limits for radar devices & imaging systems - Singapore [i.15]

Technical Requirements for Ultra-Wideband (UWB) Imaging Systems based on FCC Part 15 Subpart F (In this Table, unless otherwise stated, the unit of frequency is MHz and the unit of e.i.r.p. is dBm/MHz.)																																																						
Systems / Applications	GPR and wall imaging		Through-wall imaging		Surveillance imaging	Medical imaging																																																
Operating bands	Below 960 MHz	Between 3400 and 10600 MHz	Below 960 MHz	Between 3400 MHz and 10600 MHz	Between 3400 MHz and 10600 MHz.	Between 3400 MHz and 10600 MHz.																																																
Radiated emission limits of resolution bandwidth of 1 MHz	See FCC Part 15 § 15.209 for emission limits	<table border="1"> <thead> <tr> <th>Frequency</th> <th>e.i.r.p.</th> </tr> </thead> <tbody> <tr><td>960-1610</td><td>-65.3</td></tr> <tr><td>1610-1990</td><td>-53.3</td></tr> <tr><td>1990-3100</td><td>-51.3</td></tr> <tr><td>3100-10600</td><td>-41.3</td></tr> <tr><td>Above 10600</td><td>-51.3</td></tr> </tbody> </table>	Frequency	e.i.r.p.	960-1610	-65.3	1610-1990	-53.3	1990-3100	-51.3	3100-10600	-41.3	Above 10600	-51.3	<table border="1"> <thead> <tr> <th>Frequency</th> <th>e.i.r.p.</th> </tr> </thead> <tbody> <tr><td>960-1610</td><td>-65.3</td></tr> <tr><td>1610-1990</td><td>-53.3</td></tr> <tr><td>Above 1990</td><td>-51.3</td></tr> </tbody> </table>	Frequency	e.i.r.p.	960-1610	-65.3	1610-1990	-53.3	Above 1990	-51.3	<table border="1"> <thead> <tr> <th>Frequency</th> <th>e.i.r.p.</th> </tr> </thead> <tbody> <tr><td>960-1610</td><td>-46.3</td></tr> <tr><td>1610-1990</td><td>-41.3</td></tr> <tr><td>Above 1990</td><td>-51.3</td></tr> </tbody> </table>	Frequency	e.i.r.p.	960-1610	-46.3	1610-1990	-41.3	Above 1990	-51.3	<table border="1"> <thead> <tr> <th>Frequency</th> <th>e.i.r.p.</th> </tr> </thead> <tbody> <tr><td>960-1610</td><td>-53.3</td></tr> <tr><td>1610-1990</td><td>-51.3</td></tr> <tr><td>1990-10600</td><td>-41.3</td></tr> <tr><td>Above 10600</td><td>-51.3</td></tr> </tbody> </table>	Frequency	e.i.r.p.	960-1610	-53.3	1610-1990	-51.3	1990-10600	-41.3	Above 10600	-51.3	<table border="1"> <thead> <tr> <th>Frequency</th> <th>e.i.r.p.</th> </tr> </thead> <tbody> <tr><td>960-1610</td><td>-65.3</td></tr> <tr><td>1610-1990</td><td>-53.3</td></tr> <tr><td>3100-10600</td><td>-41.3</td></tr> <tr><td>Above 10600</td><td>-51.3</td></tr> </tbody> </table>	Frequency	e.i.r.p.	960-1610	-65.3	1610-1990	-53.3	3100-10600	-41.3	Above 10600	-51.3
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Peak level emissions in 50 MHz bandwidth		0 dBm e.i.r.p.	0 dBm e.i.r.p.	0 dBm e.i.r.p.	0 dBm e.i.r.p.	0 dBm e.i.r.p.																																																
Remarks	The use of UWB imaging system with peak emission below the 960 MHz or in the 3400 to 10600 MHz band shall be approved on an exceptional basis.																																																					

16 Summary Application Support

Table 12: Overview of defined applications

Region	Country	Indoor	Fixed Outdoor	Automotive	Radar
Americas, North	Canada	Yes RSS-220	No	?	Ground probing: RSS-220 [i.6] In-wall: RSS-220 [i.6] Through-wall: RSS-220 [i.6] Surveillance: RSS-220 [i.6] Medical Imaging: RSS-220 [i.6]
	US	Yes §15.517 [i.7] §15.519 [i.7]	With Waiver only	Yes §15.250 [i.7]	Ground probing: §15.509 [i.7] Through-wall, Surveillance, Medical Imaging, Vehicular.
EMEA	EC	Yes ETSI EN 302 065-1 [i.1]	Partly ETSI EN 302 065-2 [i.2]	Yes ETSI EN 302 065-3 [i.3]	Ground probing: ETSI EN 302 066 [i.4] and [i.5]
	Saudi Arabia	Yes	Partly	Yes	
	Switzerland	Yes	Partly	Yes	
Asia	Australia	Yes	Partly	Yes	
	China	Yes	Yes	Yes	
	Japan	Yes	No	?	
	Korea	Yes	No	Yes	
	Malaysia	Yes	Partly	Yes	
	New Zealand	Yes	No	Yes	
	Singapore	Yes	No	Yes	GPR

History

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