RADIO REPORT

FCC 47 CFR Part 15F

Ultra Wide Band Devices

Report Reference No	G0M-2012-9520-TFC15FUW-V02
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	DAkkS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	Tharsus Limited
Address	Birmayne House Cowley Road NE24 5TF Blyth United Kingdom
Test Specification	47 CFR Part 15F
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	RF Proximity Module
Model(s)	BUMP-718-F
Additional Model(s)	None
Brand Name(s)	Tharsus
Hardware Version(s)	718-F
Software Version(s)	3
FCC ID	2AYMM-BUMP-718-F
Test Result	**PASSED**

Possible test case verdicts:		
Required by standard but not tested	N/T	
Not required by standard	N/R	
Not applicable to EUT	N/A	
Test object does meet the requirement	P(PASS)	
Test object does not meet the requirement	F(FAIL)	
Testing:		
Test Lab Temperature	20 °C - 30 °C	
Test Lab Humidity	25 % - 55 %	
Date of receipt of test item	2020-12-14	
Report:		
Compiled by	Florian Voigt	
Tested by (+ signature) (Responsible for Test)	Florian Voigt	F. Voi .....
Approved by (+ signature) (Deputy Head of Lab)	Toralf Jahn	T. J .....
Date of Issue	2021-03-31	
Total number of pages	56	
General Remarks:		
The test results presented in this report relate only to the object tested. **The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.** This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.		
Additional Comments:		
Transmitters will be disabled in charging mode		

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2021-03-25	Initial Release	
02	2021-03-31	Replaced document: G0M-2012-TFC15FUW-V01 Replaced by: G0M-2012-TFC15FUW-V02 Reason: Number of sweep points has been corrected in 3.4.5 Sweep time has been added in 3.4.5	Florian Voigt

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
EUT	Equipment Under Test
FCC	Federal Communications Commission
RBW	Resolution bandwidth
RFID	Radio Frequency Identification
RMS	Root mean square
VBW	Video bandwidth
V_{NOM}	Nominal supply voltage

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1 Equipment (Test Item) Under Test

Description	RF Proximity Module	
Model	BUMP-718-F	
Additional Model(s)	None	
Brand Name(s)	Tharsus	
Serial Number(s)	None	
Hardware Version(s)	718-F	
Software Version(s)	3	
FCC ID	2AYMM-BUMP-718-F	
Equipment class	Hand held	
Equipment type	End Product	
Radio type	Transceiver	
Operating frequency range	6.240 - 6.7392 GHz	
Radio technology	Ultra Wide-band	
Modulation	BPM	
Antenna	Type	Integrated
	Model	AH086M555003-T
	Manufacturer	Taiyo-Yuden
	Gain	2.6 dBi
Battery Supply Voltage	V_{NOM}	3.7 VDC
USB Supply Voltage (Charging)	V_{NOM}	5.0 VDC
Operating Temperature	T_{NOM}	25 °C
AC/DC-Adaptor	None	
Manufacturer	Tharsus Limited Birmayne House Cowley Road NE24 5TF Blyth United Kingdom	

1.1 Photos – Equipment External

BUMP IN PERSPECTIVE I

BUMP IN PERSPECTIVE II

Note: EUT is placed with the flat side towards the ground. This represents horizontal EUT positioning

BUMP TOP SIDE

BUMP BOTTOM SIDE

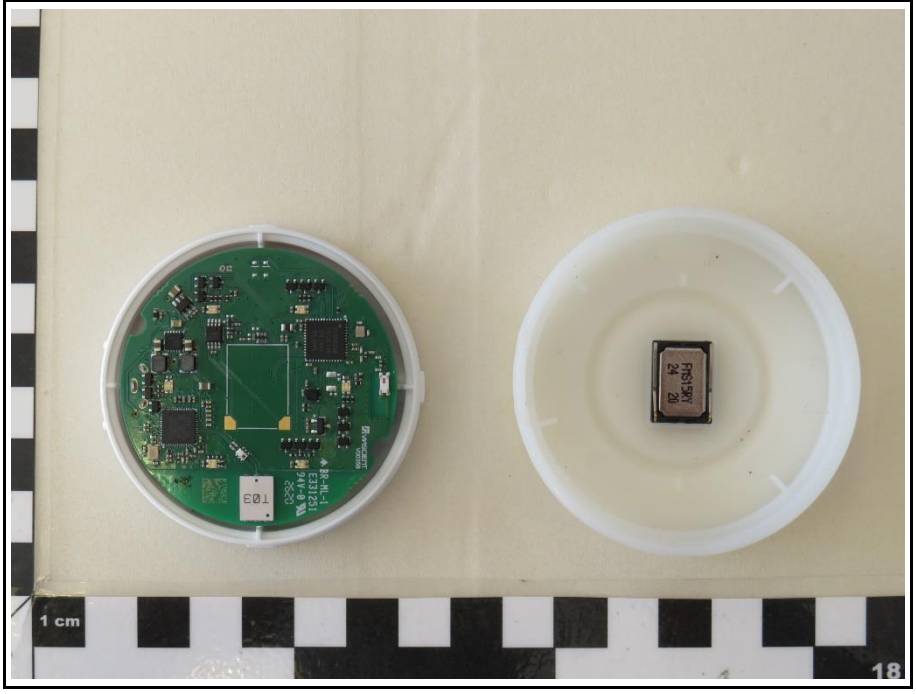
BUMP SIDE

Note: EUT is placed with the short side towards the ground. This represents vertical EUT positioning

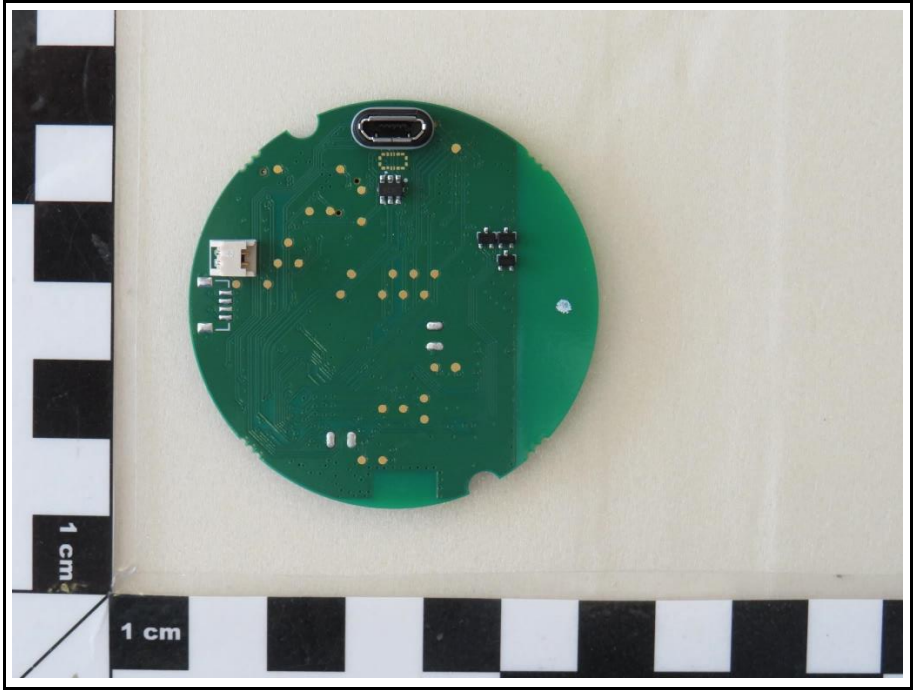
1.2 Photos – Equipment Internal

BUMP BOTTOM COVER

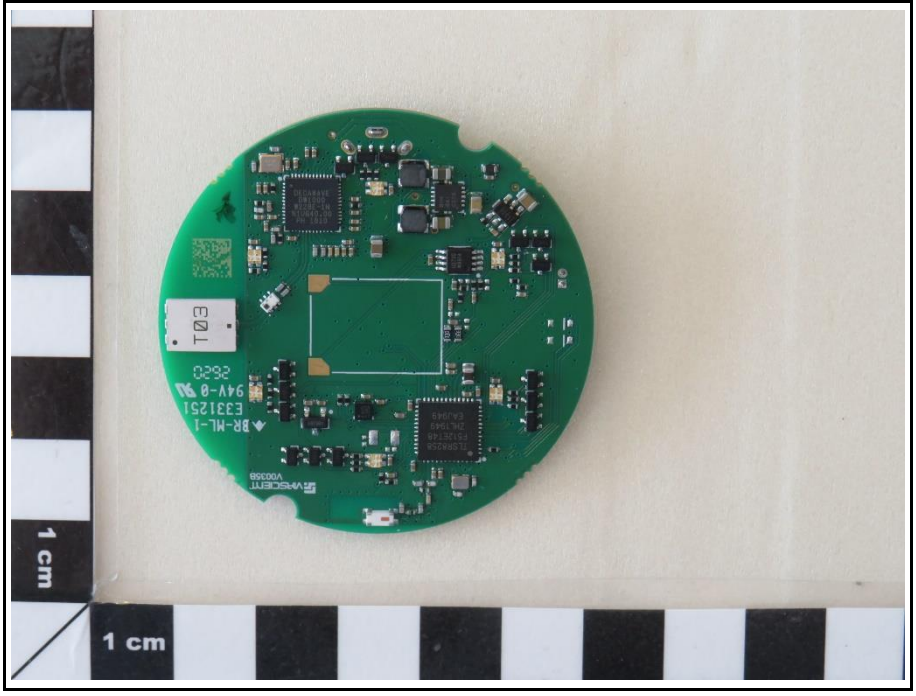
OPEN BUMP WITH TOP AND BOTTOM COVER



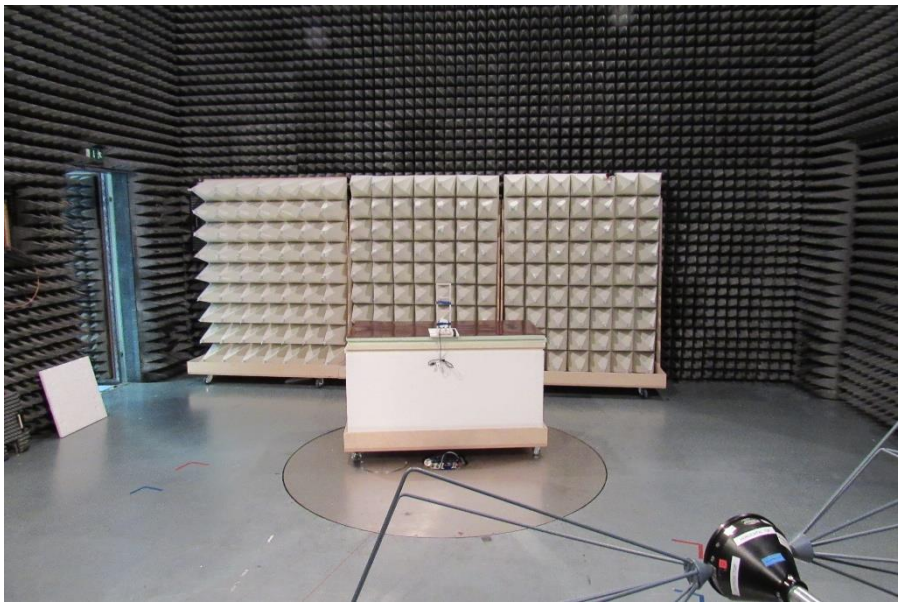
PCB BOTTOM SIDE

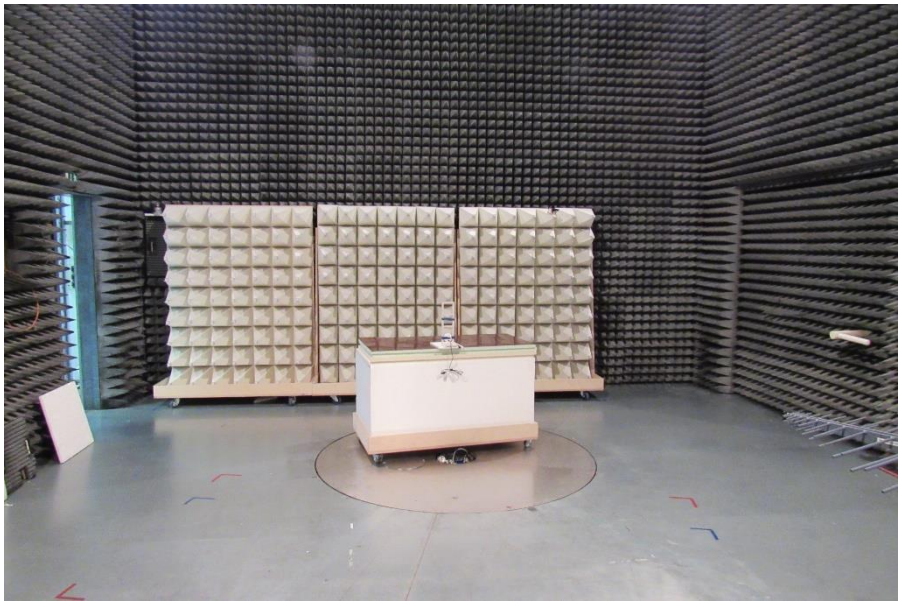


PCB TOP SIDE

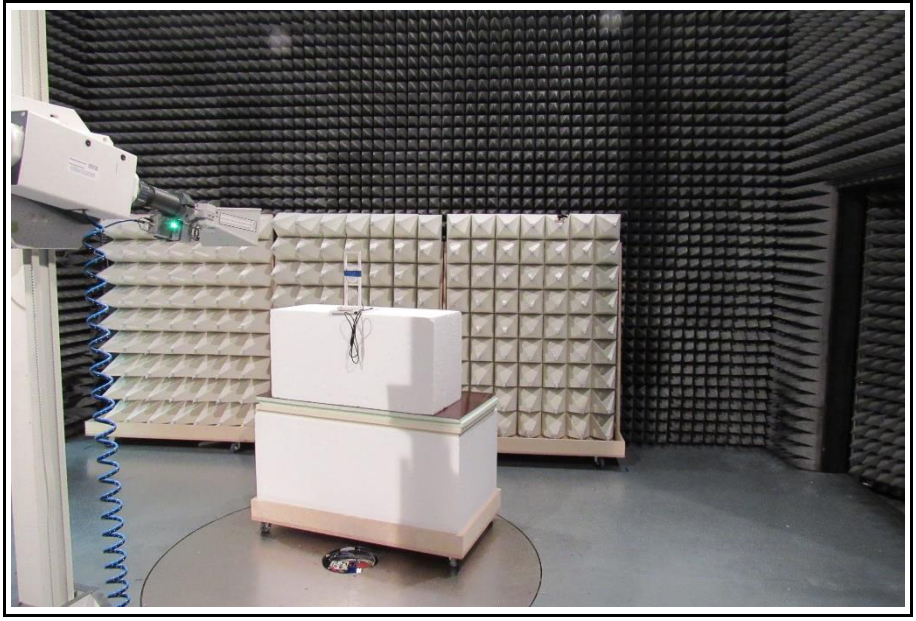


1.3 Photos – Test Setup

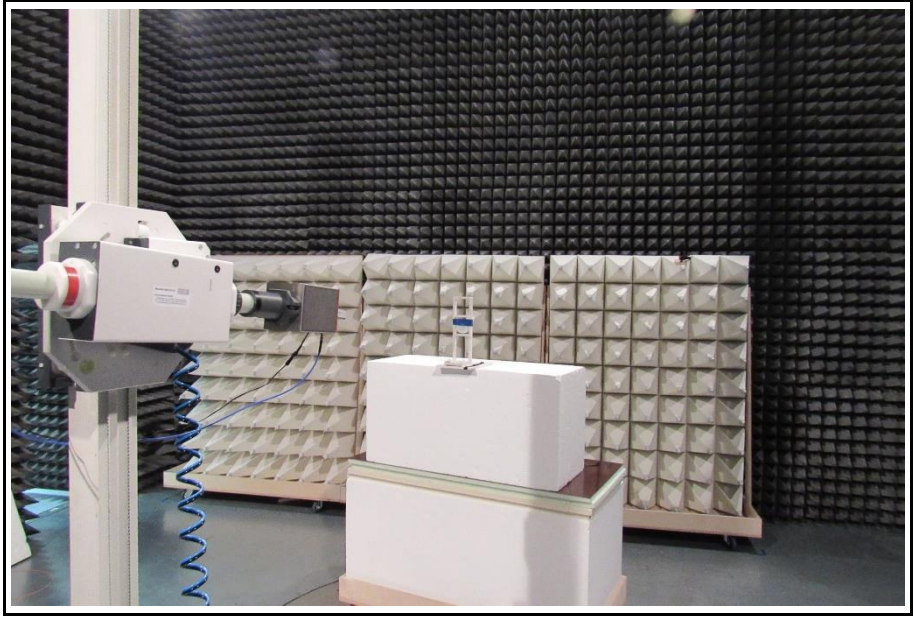
Test setup radiated emission below 200MHz


Test setup radiated emission 200 to 1000MHz


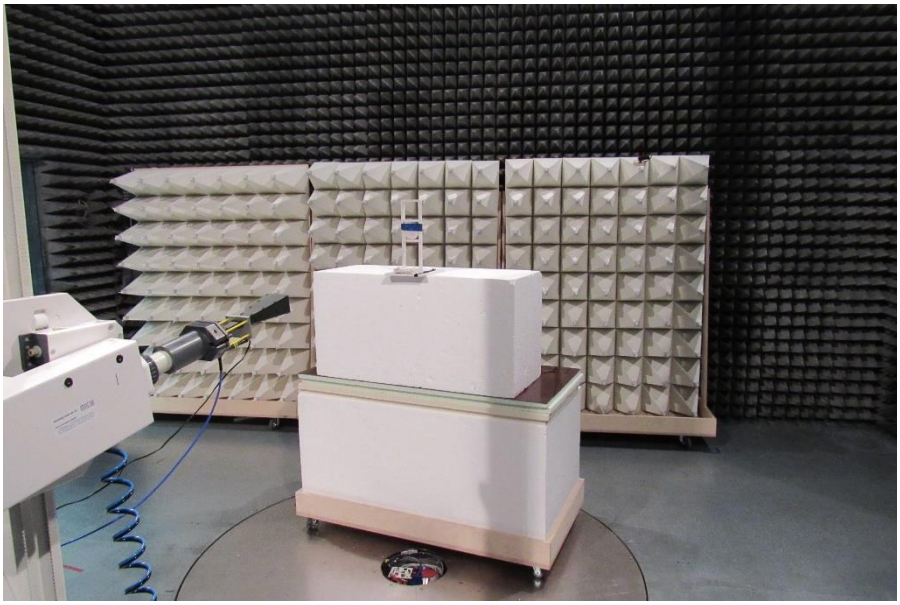
Test setup radiated emission 1 to 17GHz



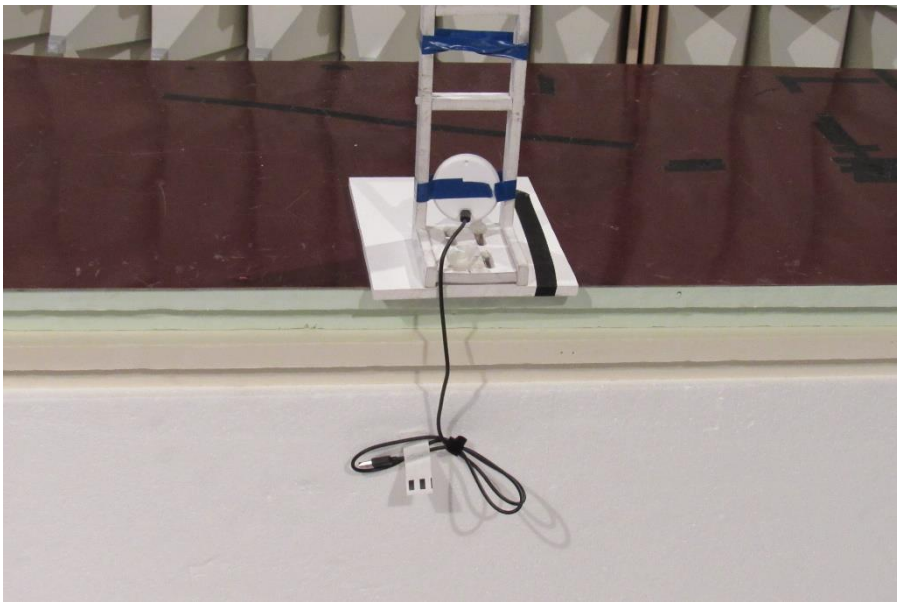
Test setup radiated emission 17 to 26.5GHz

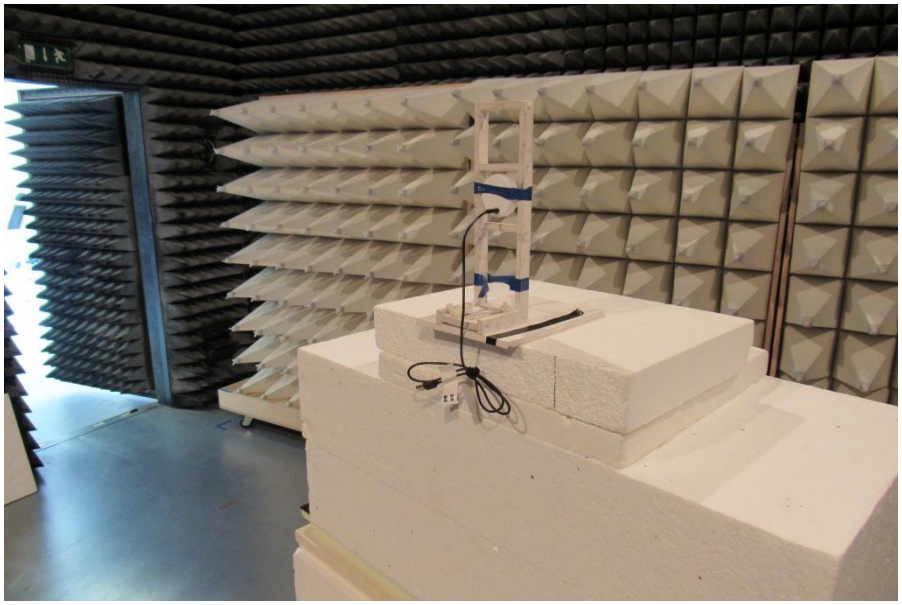


Test setup radiated emission above 26.5GHz



Test setup radiated emission EUT view 0.8m



Test setup radiated emission EUT view 1.5m


1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
None				
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment:				

1.5 Test Modes

Mode	Description
Transmit	Mode = Transmit Modulation = BPM Duty cycle = 100%
Comment:	

1.6 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx	5	6489.6

1.7 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in dBµV. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

Reading on Analyzer (dBµV) + A.F. (dB/m) = Net field strength (dBµV/m)

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of dBµV/m). The FCC limits are given in units of µV/m. The following formula is used to convert the units of µV/m to dBµV/m:

Limit (dBµV/m) = 20*log (µV/m)

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

Reading + AF	= Net Reading	:	Net reading - FCC limit	= Margin
+21.5 dBµV + 26 dB/m	= 47.5 dBµV/m	:	47.5 dBµV/m - 57.0 dBµV/m	= -9.5 dB

2 Result Summary

FCC 47 CFR Part 15F				
Product Standard Reference	**Requirement**	**Reference Method**	**Result**	**Remarks**
FCC 15.503(a), 15.519(b)	UWB (-10 dB) Bandwidth	ANSI C63.10-2013	PASS	
FCC 15.519(e)	Peak power	ANSI C63.10-2013	PASS	
FCC 15.519(a)(1)	Cease of transmitter operation	ANSI C63.10-2013	PASS	
FCC 15.519(c)(d)	Transmitter radiated emissions	ANSI C63.10-2013	PASS	
FCC 15.207	AC power line conducted emissions	ANSI C63.10-2013	N/R	EUT does not transmit in charging mode
Comment:				

Possible Test Case Verdicts	
PASS	Test object does meet the requirements
FAIL	Test object does not meet the requirements
N/T	Required by standard but not tested
N/R	Not required by standard for the test object

3 Test Conditions and Results

3.1 Test Conditions and Results - UWB (-10 dB) Bandwidth

3.1.1 Information

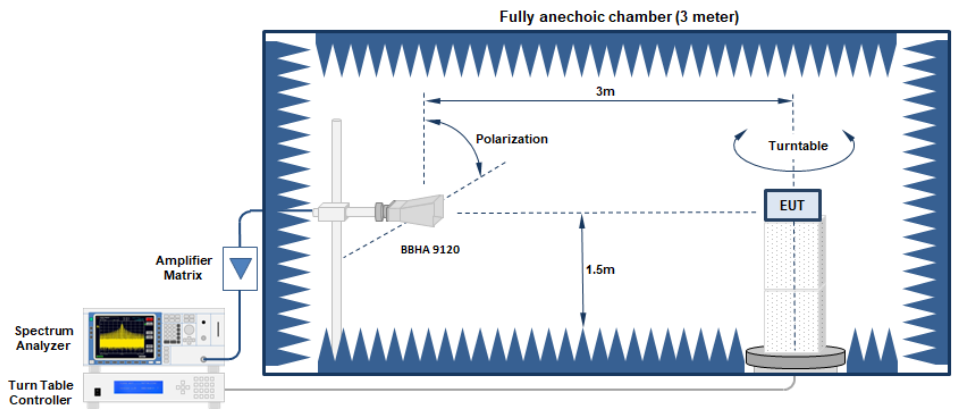
Test Information	
Product Standard Reference	FCC Part 15.519 (a)
Measurement Method	ANSI C63.10 10.1
Measurement Uncertainty	± 1.26 %
Date	2021-02-11
Operator	Florian Voigt

3.1.2 Limits

Limits
UWB (-10 dB) bandwidth totally contained in the band 3.1 - 10.6 GHz

3.1.3 Setup

Test Setup



3.1.4 Equipment

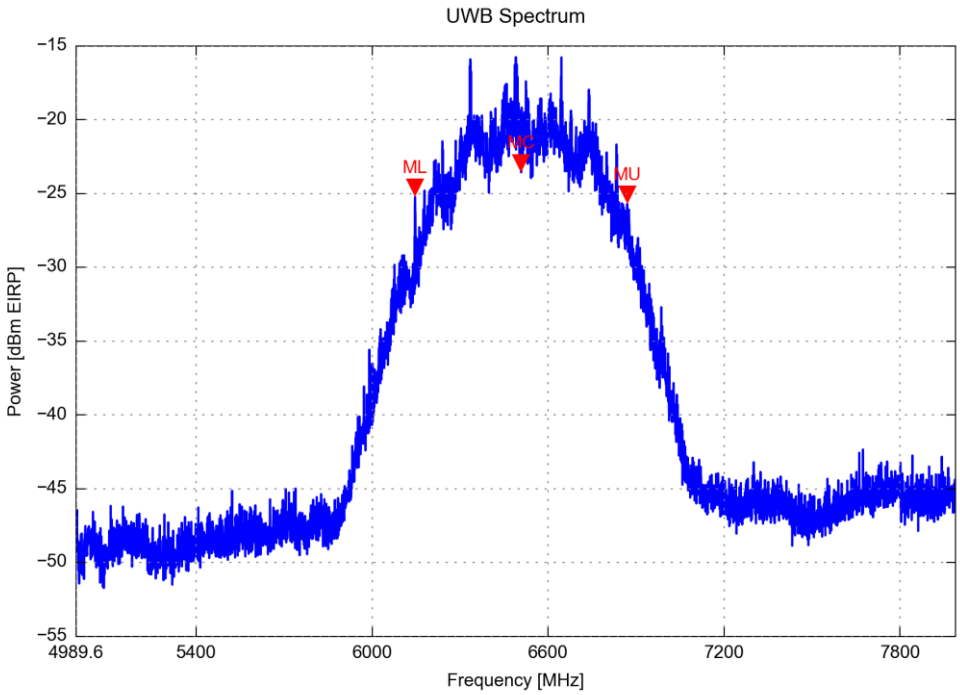
Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
Spectrum Analyzer	R&S	FSU 26	EF01003	2020-07	2021-07
Antenna	Schwarzbeck	BBHA 9120D	EF00019	2020-11	2022-11

3.1.5 Procedure

Test Procedure
1. EUT set to test mode 2. The turntable and antenna polarization are set to the maximum emission level for the fundamental emission of the EUT 3. Span is set so that the complete fundamental emission spectrum is captured 3. Resolution bandwidth set to 1 MHz and the VBW is set to 3 MHz with peak detector and max. hold 4. The emission spectrum is corrected by the antenna gain cable loss, low-noise amplifier gain 5. The maximum of the spectrum envelope is determined as reference 6. The spectrum is searched from the left edge to the center of the spectrum in order to find the lower -10 dB frequency 7. The spectrum is searched from the right edge to the center of the spectrum in order to find the upper -10 dB frequency 8. From the lower and upper frequency the center frequency, the -10 dB bandwidth and the fractional bandwidth are calculated

-10 dB Bandwidth

Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Reference Standards:	FCC 15F
Reference Method:	ANSI C63.10:2013, Section 10.1
Operational Mode:	6489.6 GHz
Operating Conditions:	Tnom/Vnom
Operator:	Florian Voigt
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-02-11
Equipment class:	Hand held UWB systems (Hand-held Communication Devices)
Center Frequency [MHz] (MC):	6508.200
Lower Frequency [MHz] (ML):	6146.400
Upper Frequency [MHz] (MU):	6870.000
-10 dB Bandwidth [MHz]:	723.600
Fractional Bandwidth [MHz]:	0.111
Bandwidth Verdict:	PASS



3.2 Test Conditions and Results - Maximum Peak Power

3.2.1 Information

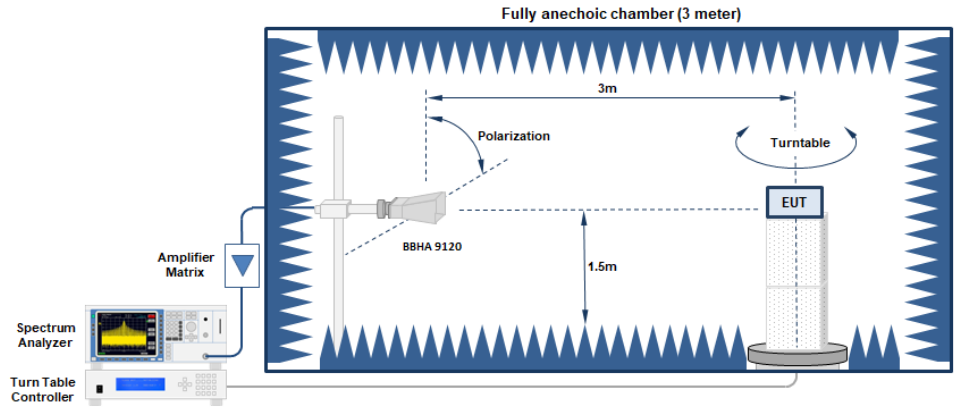
Test Information	
Product Standard Reference	FCC Part 15.519 (e)
Date	2021-02-04
Operator	Florian Voigt
Measurement Method	ANSI C63.10 10.3.5, 10.3.6, 10.3.9
Measurement Uncertainty	± 2.86 dB

3.2.2 Limits

Limits	
Bandwidth [MHz]	Power [dBm EIRP]
50	0

3.2.3 Setup

Test Setup



3.2.4 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2020.1.8

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
Spectrum Analyzer	R&S	FSU 26	EF01003	2020-07	2021-07
Antenna	Schwarzbeck	BBHA 9120D	EF00019	2020-11	2022-11

3.2.5 Procedure

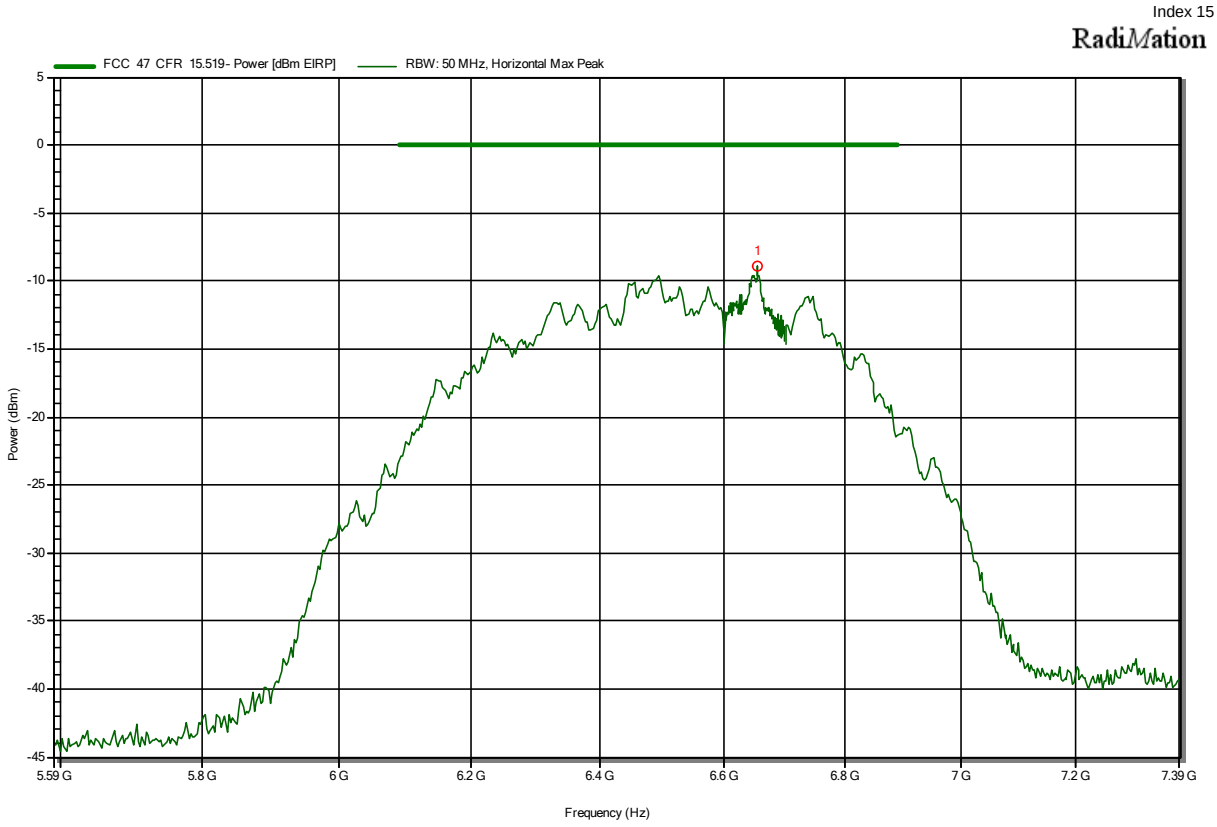
Test Procedure
1. EUT set to test mode 2. The turntable and antenna polarization are set to the maximum emission level for the fundamental emission of the EUT 3. Span is set so that the complete fundamental emission spectrum is captured 3. Resolution bandwidth set to 50 MHz and the VBW is set to maximum with peak detector and max. hold 4. The emission spectrum is corrected by the antenna gain cable loss, low-noise amplifier gain and path loss 5. The maximum of the spectrum envelope is determined and compared to the limit

3.2.6 Results

Test Results				
Channel [MHz]	Emission [MHz]	Power [dBm EIRP]	Limit [dBm EIRP]	Margin [dB]
6489.6	6655	-8.9	0	-8.9

Radiated carrier according to FCC 47 CFR Part 15 Subpart F

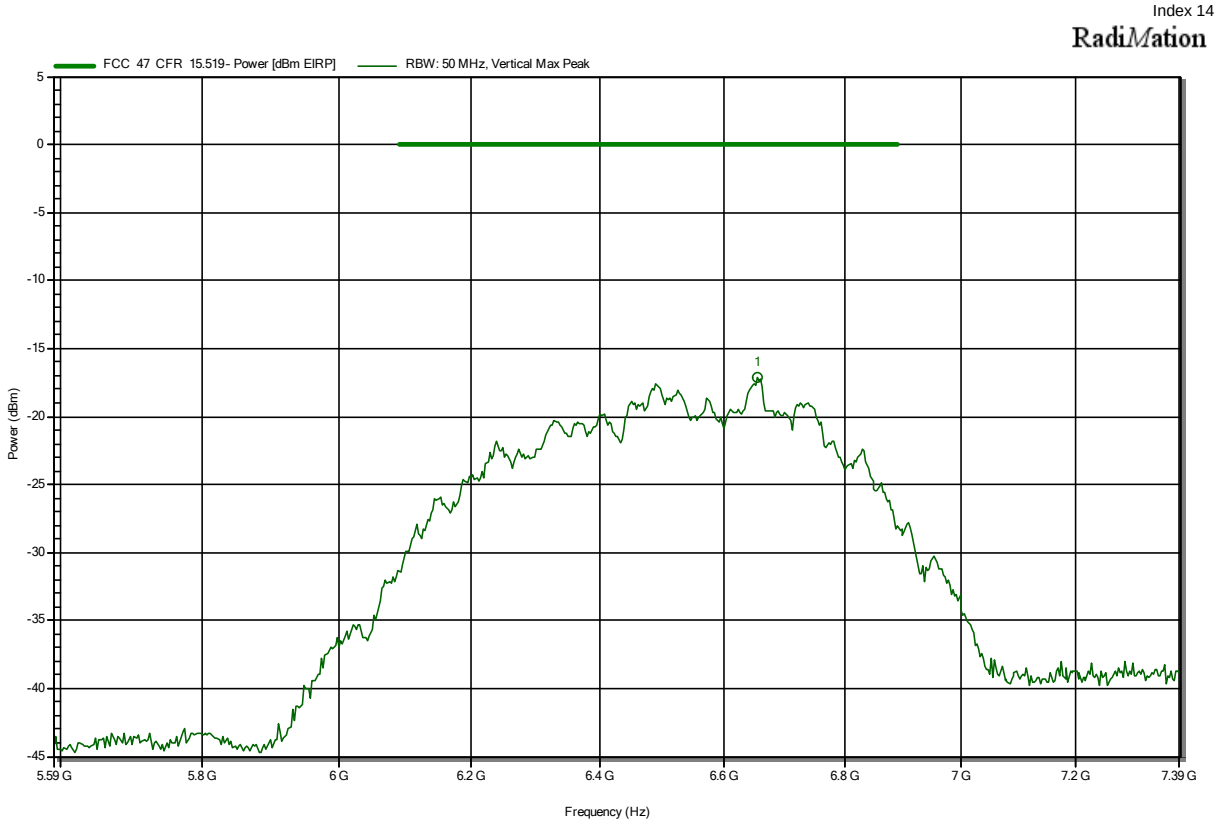
Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT hor
Test Date:	2021-02-04
Note:	



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
6.65498 GHz	-8.9 dBm	0 dBm	-8.9 dB	Pass

Radiated carrier according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT hor
Test Date:	2021-02-04
Note:	



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
6.65402 GHz	-17.1 dBm	0 dBm	-17.08 dB	Pass

3.3 Test Conditions and Results - Cease of transmitter operation

3.3.1 Information

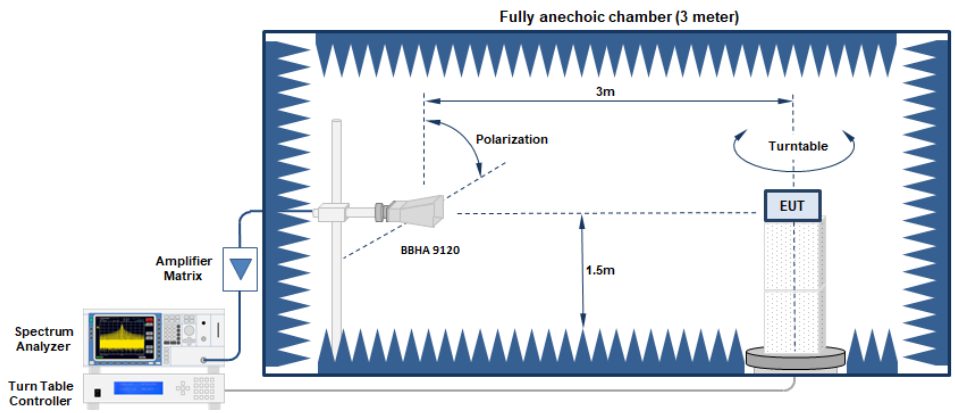
Test Information	
Product Standard Reference	FCC Part 15.519 (a)(1)
Date	2021-02-11
Operator	Florian Voigt

3.3.2 Limits

Limits - FCC
A UWB device 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.

3.3.3 Setup

Test Setup



3.3.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber	Frankonia	AC 4	EF00200	---	---
Spectrum Analyzer	R&S	FSU 26	EF01003	2020-07	2021-07
Antenna	Schwarzbeck	BBHA 9120D	EF00019	2020-11	2022-11

3.3.5 Procedure

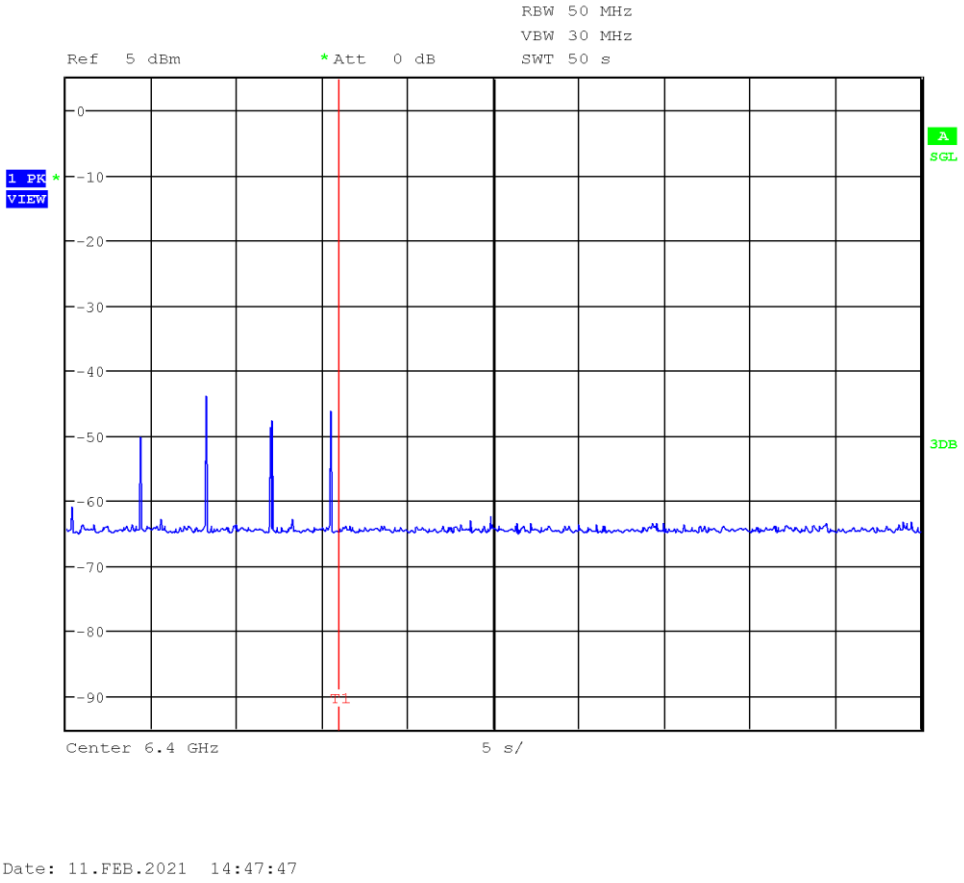
Test Procedure
1. EUT set to normal operation 2. The emissions of the EUT are captured with a spectrum analyzer 3. The transmitter is stopped either by switching off the companion device or by releasing the manual switch 4. From the moment the transmitter is released the emission are recorded and a marker is set to the moment the transmitter has switched off 5. The marker time is recorded an compared to the limit

3.3.6 Results

Test Results			
Channel [MHz]	Transmission stop time [s]	Limit [s]	Margin [s]
6489.6	0	10	-10

Cease of transmitter operation test

Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Operator:	Florian Voigt
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-02-11
Operating Conditions:	Tnom/Vnom
Mode:	UWB, Normal operation mode
Note1:	Vertical line T1 marks the time when companion device was switched off
Note2:	EUT and companion device were shaken all time to keep them activated.



3.4 Test Conditions and Results - Transmitter radiated emissions

3.4.1 Information

Test Information	
Product Standard Reference	FCC Part 15.519 (c)(d)
Measurement Method	ANSI C63.10 10.2, 10.3
Measurement Uncertainty	± 5.95 dB
Date	2021-02-04 - 2021-02-10
Operator	Florian Voigt

3.4.2 Limits

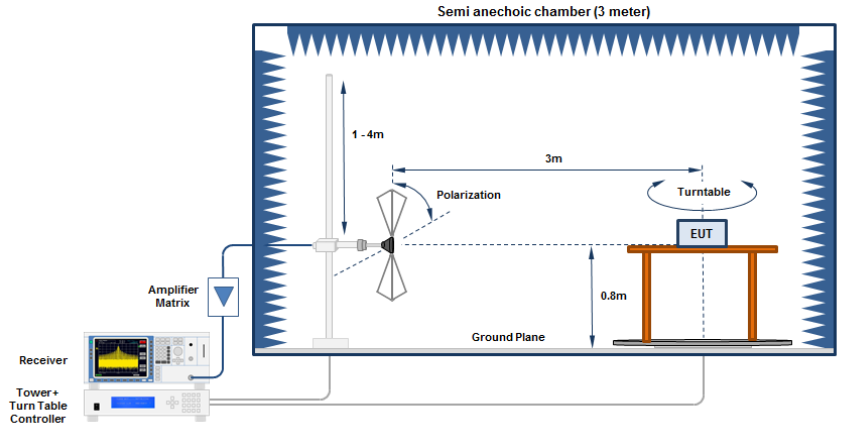
Limits - below 960 MHz			
Frequency [MHz]	Detector	Field strength [µV/m]	Measurement distance [m]
30 - 88	Quasi-Peak	100	3
88 - 216	Quasi-Peak	150	3
216 - 960	Quasi-Peak	200	3

Limits - FCC - above 960 MHz					
Frequency [MHz]	Bandwidth	Detector	Power [dBm EIRP]	Field Strength [dBµV/m@3m]	Field Strength [dBµV/m@1m]
960-1610	1 MHz	RMS	-75.3	19.9	29.5
1610-1990	1 MHz	RMS	-63.3	31.9	41.5
1990-3100	1 MHz	RMS	-61.3	33.9	43.5
3100-10600	1 MHz	RMS	-41.3	53.9	63.5
> 10600	1 MHz	RMS	-61.3	33.9	43.5

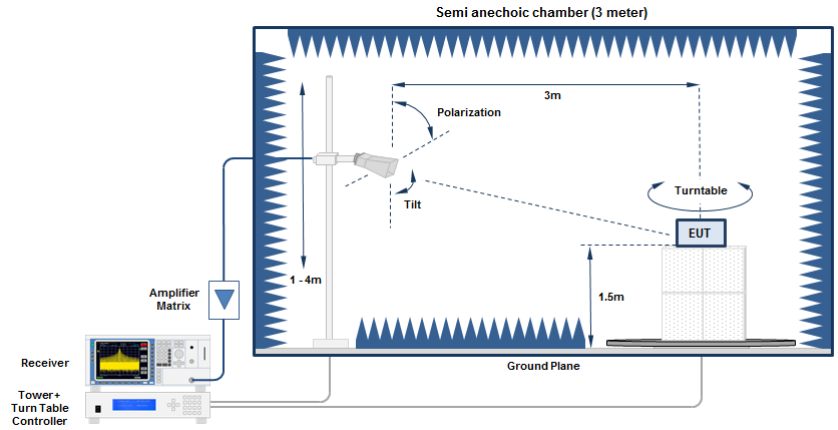
Limits - GPS Band					
Frequency [MHz]	Bandwidth	Detector	Power [dBm EIRP]	Field Strength [dBµV/m@3m]	Field Strength [dBµV/m@1m]
1164-1240	1 kHz	RMS	-85.3	9.9	19.5
1559-1610	1 kHz	RMS	-85.3	9.9	19.5

3.4.3 Setup

Test Setup - < 1 GHz



Test Setup - > 1 GHz



3.4.4 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2020.1.8

Test Equipment 30 - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2020-06	2021-06
Antenna	R&S	HK 116	EF00030	2019-04	2022-04
Antenna	R&S	HL 223	EF00187	2019-05	2022-05

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
Spectrum analyzer	R&S	FSU26	EF01003	2020-07	2021-07
Antenna	Schwarzbeck	BBHA 9120D	EF00018	2019-10	2022-10
Antenna	Amplifier Research	AT4560	EF00302	2019-05	2021-05
Antenna	Flann Microwave Ltd	22240-25 Amp. CBL26402075	EF00301	2019-12	2022-12

3.4.5 Procedure

Test Procedure 30 - 960 MHz
1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground 2. EUT set to test mode 3. The receiver is set to peak detection with max hold 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m 5. All significant emissions are measured again using the corresponding final detector

Test Procedure 960 – 1000 MHz
1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground 2. EUT set to test mode 3. The receiver is set to RMS detection with max hold, 625 sweep points and 0.6 s sweep time. 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m 5. All significant emissions are measured again using the corresponding final detector

Test Procedure > 1 GHz
1. EUT is placed on a non conducting support at the center of a turn table 1.5 m above the ground 2. EUT set to test mode 3. The receiver is set to RMS detection with max hold, 30001 sweep points and 28 s sweep time. 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m 5. All significant emissions are measured again using the corresponding final detector

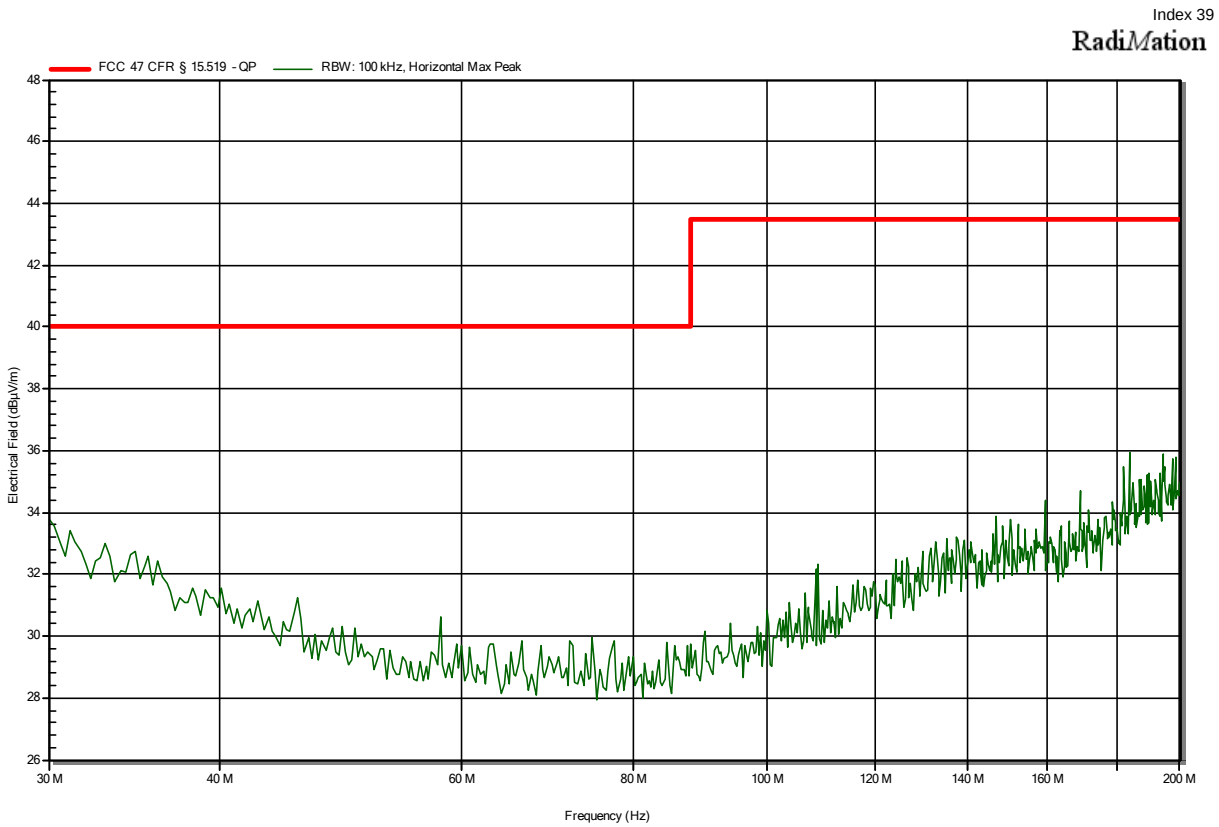
3.4.6 Results

Test Results						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
6489.6	1238.8	-80.4 dBm	RMS	ver	-75.3 dBm	-05.05
6489.6	1263	-80.2 dBm	RMS	hor	-75.3 dBm	-04.89
6489.6	2435.2	-73.4 dBm	RMS	hor	-61.3 dBm	-12.07
6489.6	2435.2	-72.8 dBm	RMS	ver	-70 dBm	-02.75
6489.6	6489.7	-41.7 dBm	RMS	hor	-41.3 dBm	-00.36
6489.6	6489.9	-49.8 dBm	RMS	ver	-41.3 dBm	-08.53
6489.6	12399.8	-67.2 dBm	RMS	hor	-61.3 dBm	-05.92
6489.6	1237.9	-80.5 dBm	RMS	ver	-75.3 dBm	-05.18
6489.6	1264.4	-80 dBm	RMS	hor	-75.3 dBm	-04.71
6489.6	12979.7	-63.2 dBm	RMS	hor	-61.3 dBm	-01.87
6489.6	12979.7	-62.5 dBm	RMS	ver	-61.3 dBm	-01.21
6489.6	26030	-64.6 dBm	RMS	hor	-61.3 dBm	-03.31

ANNEX A Transmitter radiated emissions

Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.7 VDC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	Tx; UWB, Band 5, EUT ver
Test Date:	Wednesday, February 10, 2021
Note:	



Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.7 VDC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	Tx; UWB, Band 5, EUT ver
Test Date:	Wednesday, February 10, 2021
Note:	

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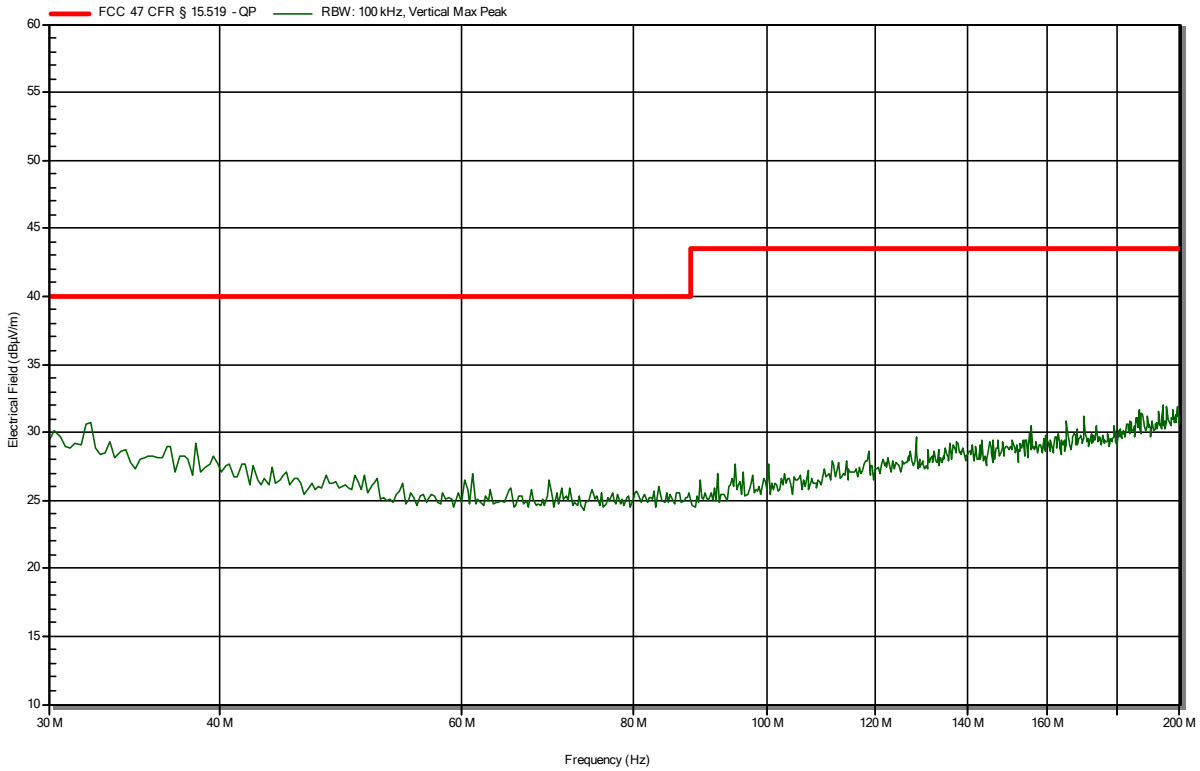
RadiMation



Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.7 VDC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	Tx; UWB, Band 5, EUT ver
Test Date:	Wednesday, February 10, 2021
Note:	

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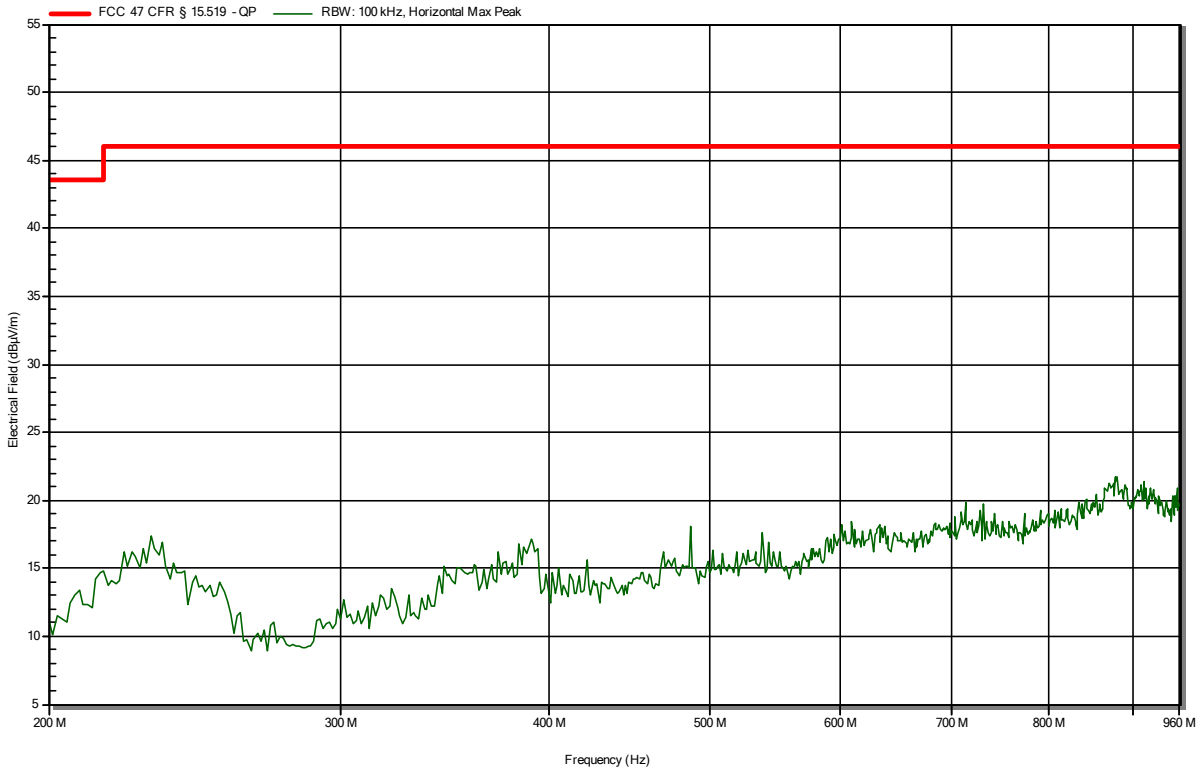
RadiMation



Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.7 VDC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	Tx; UWB, Band 5, EUT ver
Test Date:	Wednesday, February 10, 2021
Note:	

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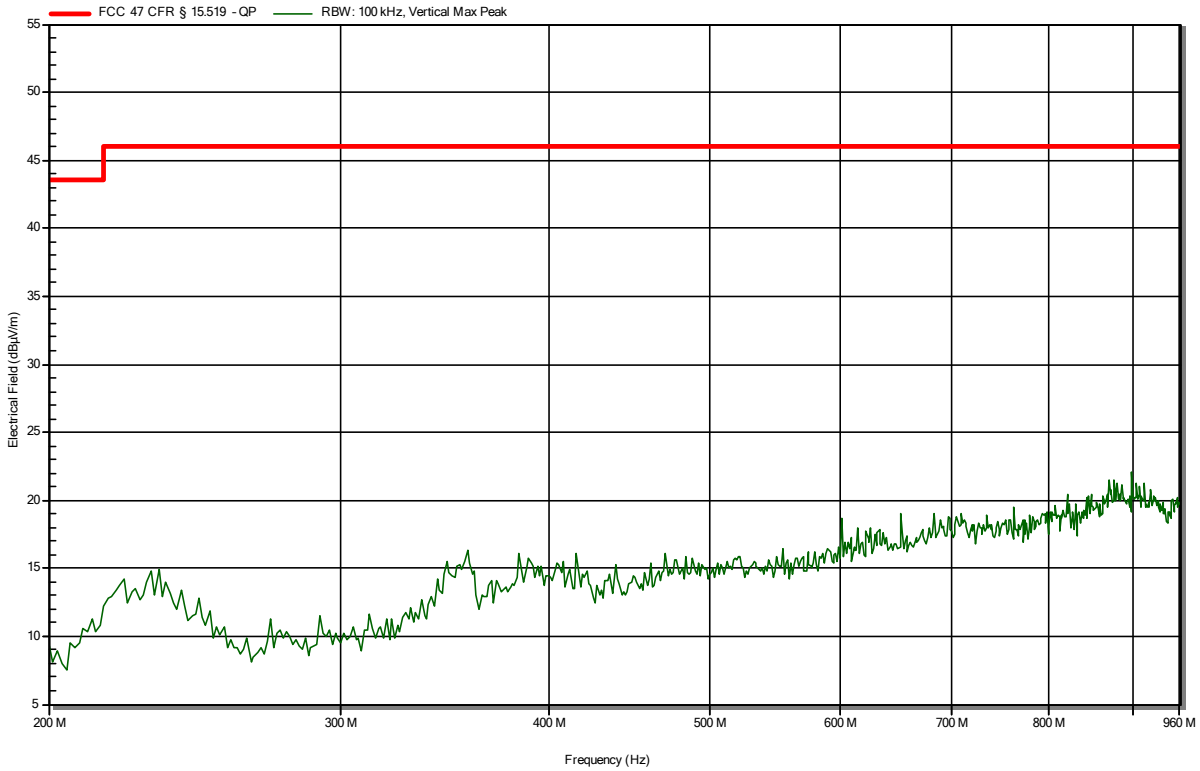
RadiMation



Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.7 VDC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	Tx; UWB, Band 5, EUT ver
Test Date:	Wednesday, February 10, 2021
Note:	

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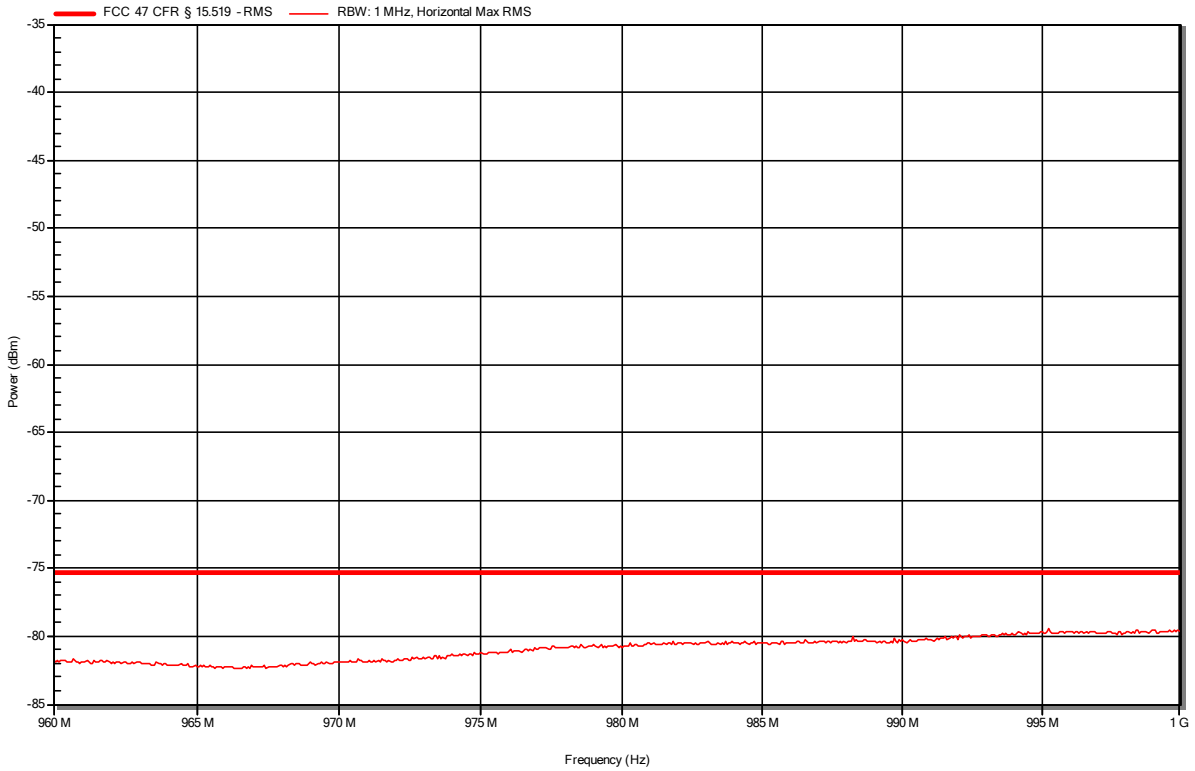
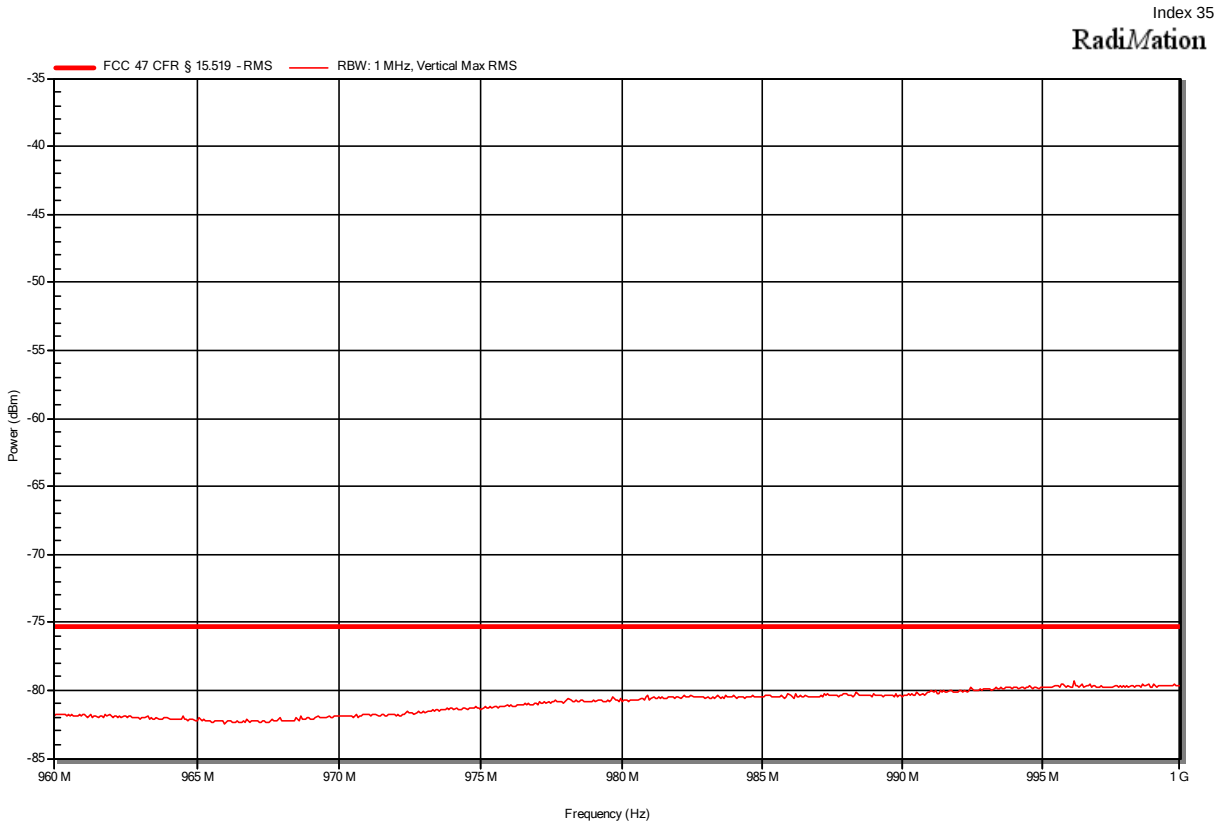
RadiMation



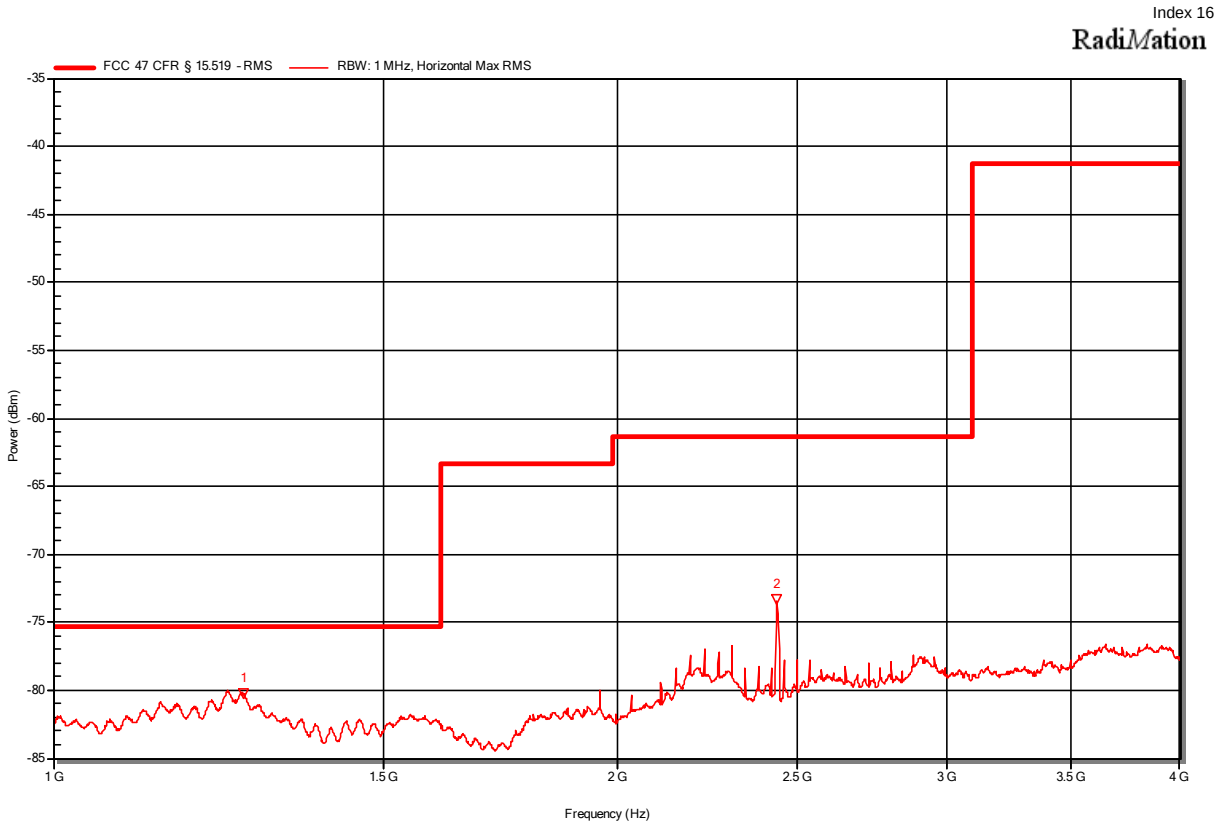
Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.7 VDC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	Tx; UWB, Band 5, EUT ver
Test Date:	Wednesday, February 10, 2021
Note:	



Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

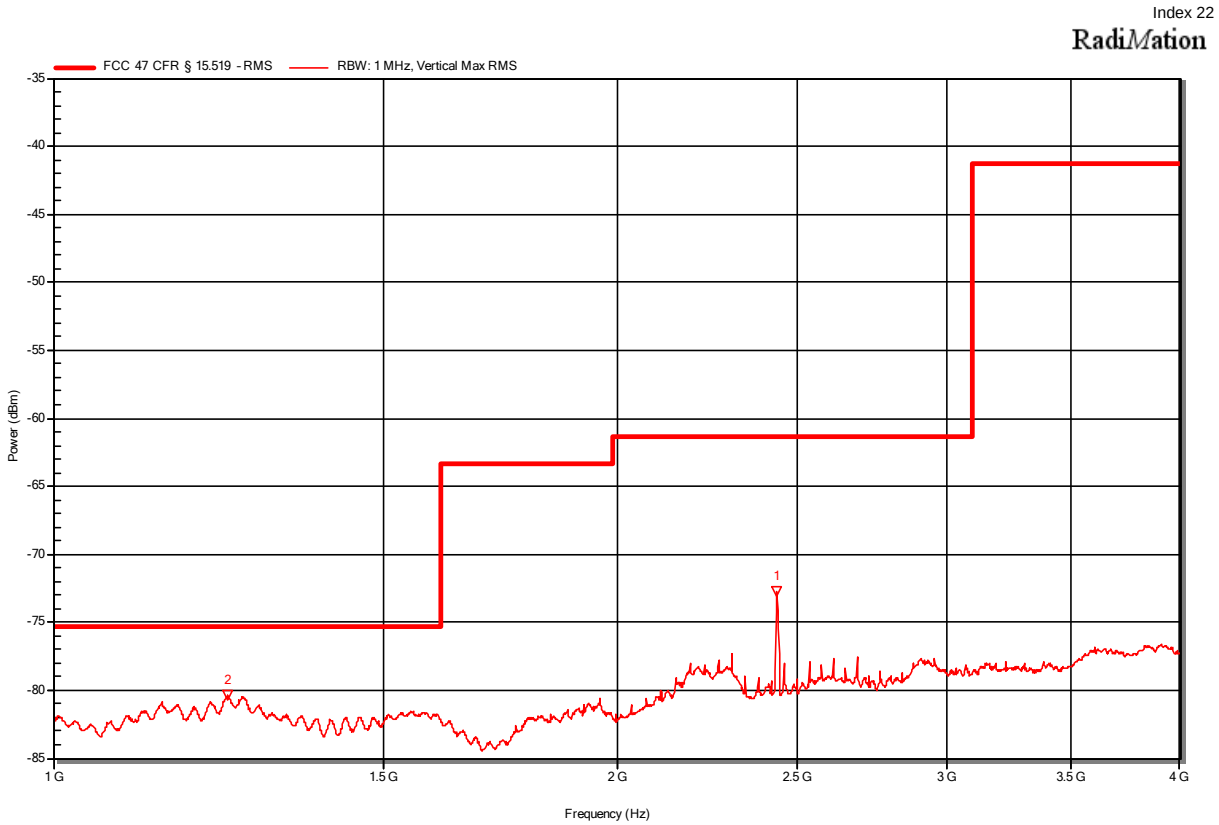
Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT hor
Test Date:	Thursday, February 4, 2021
Note:	



Frequency	RMS	RMS Limit	RMS Difference	RMS Status
1.263 GHz	-80.2 dBm	-75.3 dBm	-4.89 dB	Pass
2.4352 GHz	-73.4 dBm	-61.3 dBm	-12.07 dB	Pass

Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

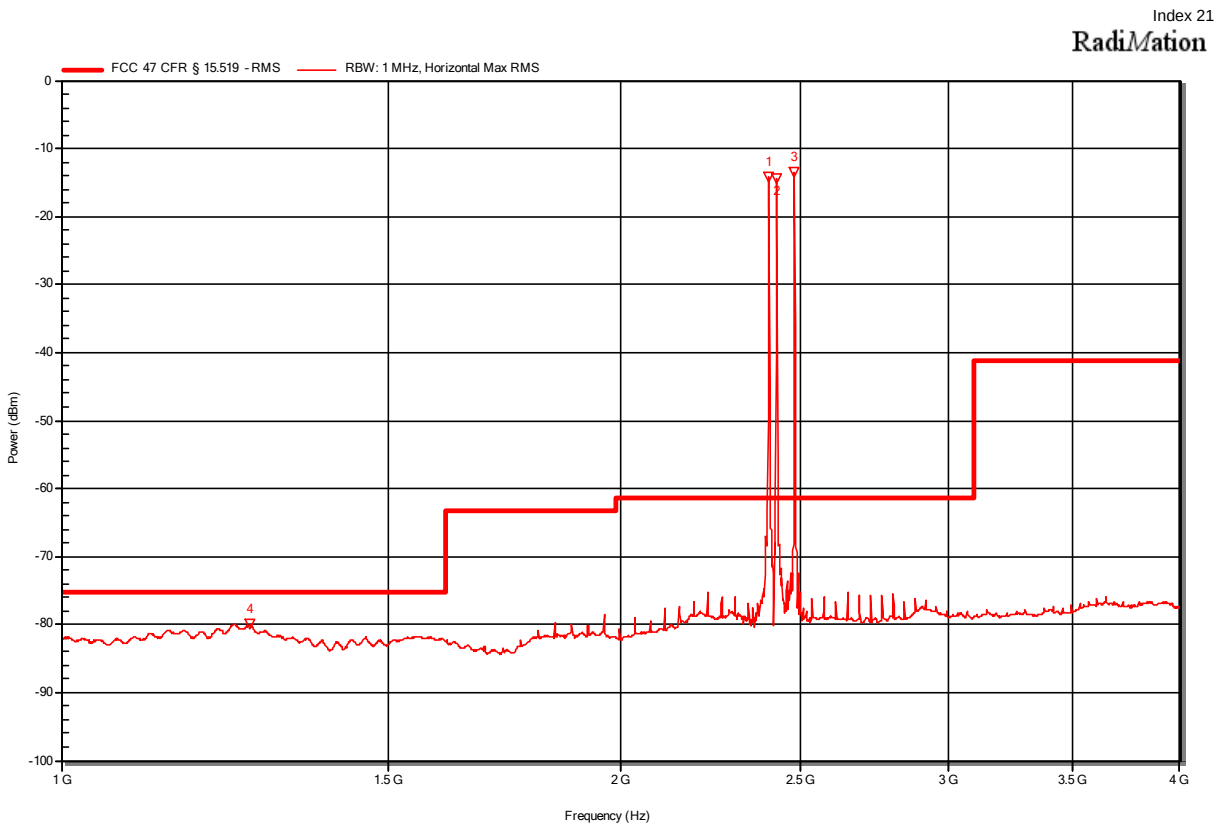
Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT hor
Test Date:	Thursday, February 4, 2021
Note:	



Frequency	RMS	RMS Limit	RMS Difference	RMS Status
1.2388 GHz	-80.4 dBm	-75.3 dBm	-5.05 dB	Pass
2.4352 GHz	-72.8 dBm	-70 dBm	-2.75 dB	Pass

Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

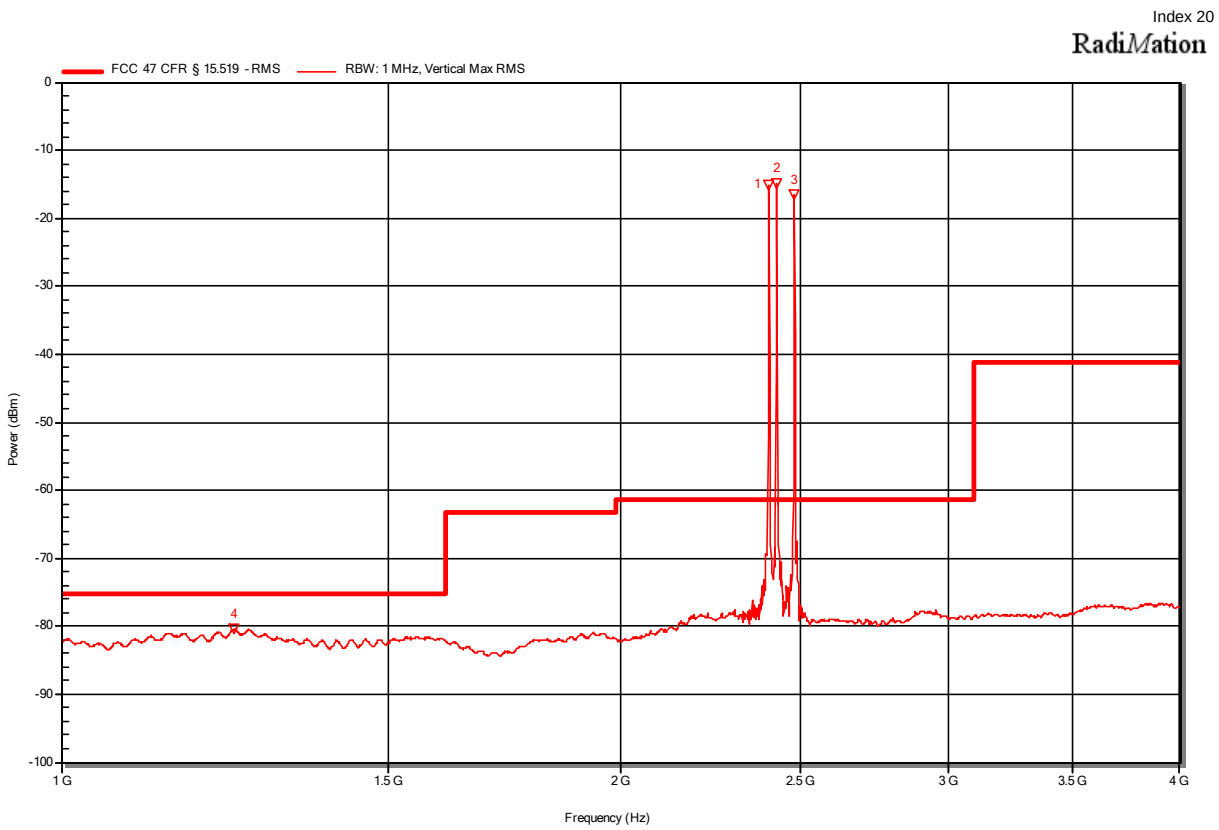
Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT ver
Test Date:	Thursday, February 4, 2021
Note:	Marker 1, 2 and 3 are LE advertisement channels of integrated BTLE Radio BTLE is only active when rotating EUT vertically (movement sensor)



Frequency	RMS	RMS Limit	RMS Difference	RMS Status
1.2644 GHz	-80 dBm	-75.3 dBm	-4.71 dB	Pass
2.4018 GHz		LE advertisement channel 0		
2.4262 GHz		LE advertisement channel 12		
2.4799 GHz		LE advertisement channel 39		

Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT ver
Test Date:	Thursday, February 4, 2021
Note:	Marker 1, 2 and 3 are LE advertisement channels of integrated BTLE radio BTLE is only active when rotating EUT vertically (movement sensor)



Frequency	RMS	RMS Limit	RMS Difference	RMS Status
1.2379 GHz	-80.5 dBm	-75.3 dBm	-5.18 dB	Pass
2.402 GHz		LE advertisement channel 0		
2.4258 GHz		LE advertisement channel 12		
2.4797 GHz		LE advertisement channel 39		

Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
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Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT hor
Test Date:	Thursday, February 4, 2021
Note:	

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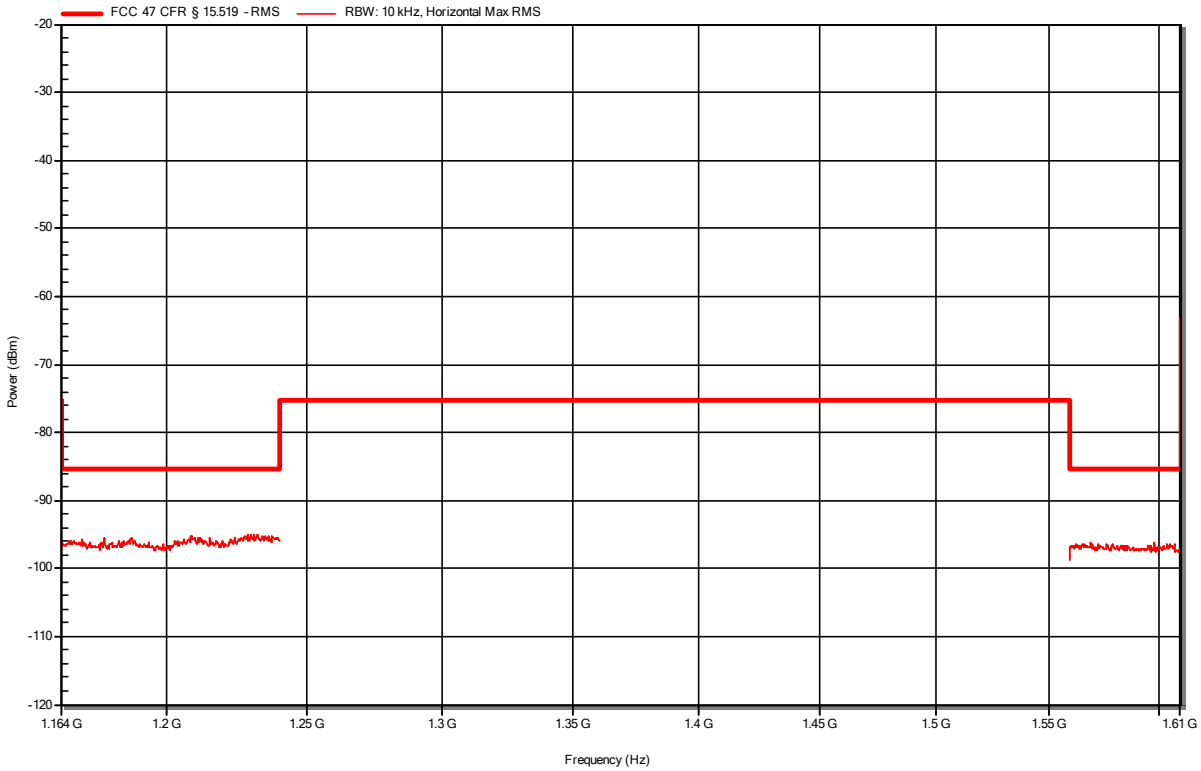
RadiMation



Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT hor
Test Date:	Thursday, February 4, 2021
Note:	

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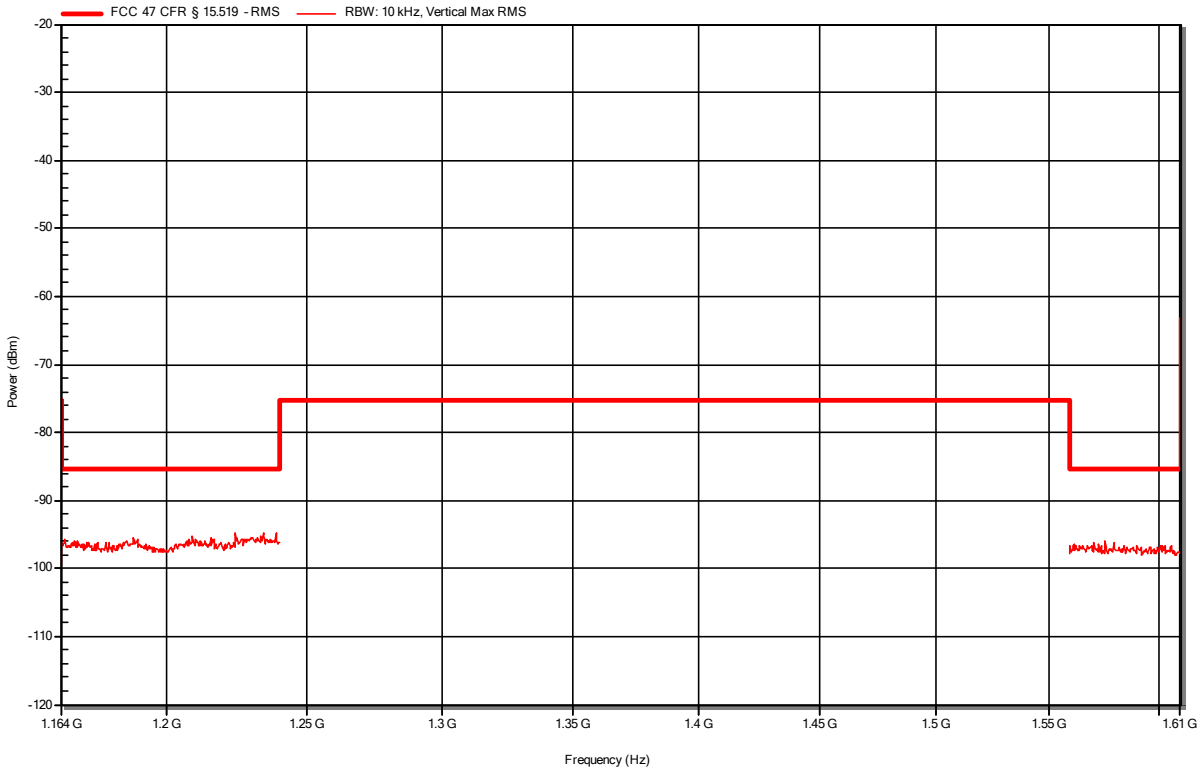
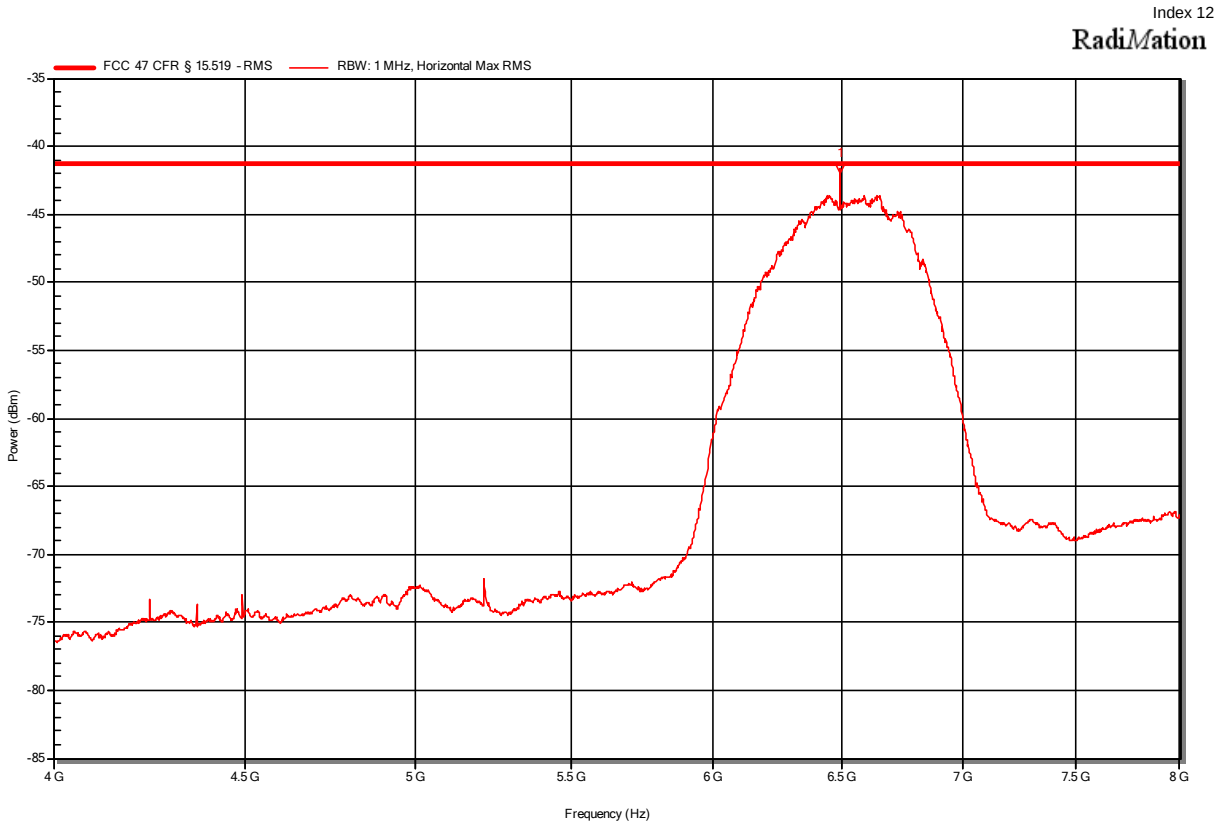
RadiMation



Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT hor
Test Date:	Thursday, February 4, 2021
Note:	



Frequency	RMS	RMS Limit	RMS Difference	RMS Status
6.4897 GHz	-41.7 dBm	-41.3 dBm	-0.36 dB	Pass

Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
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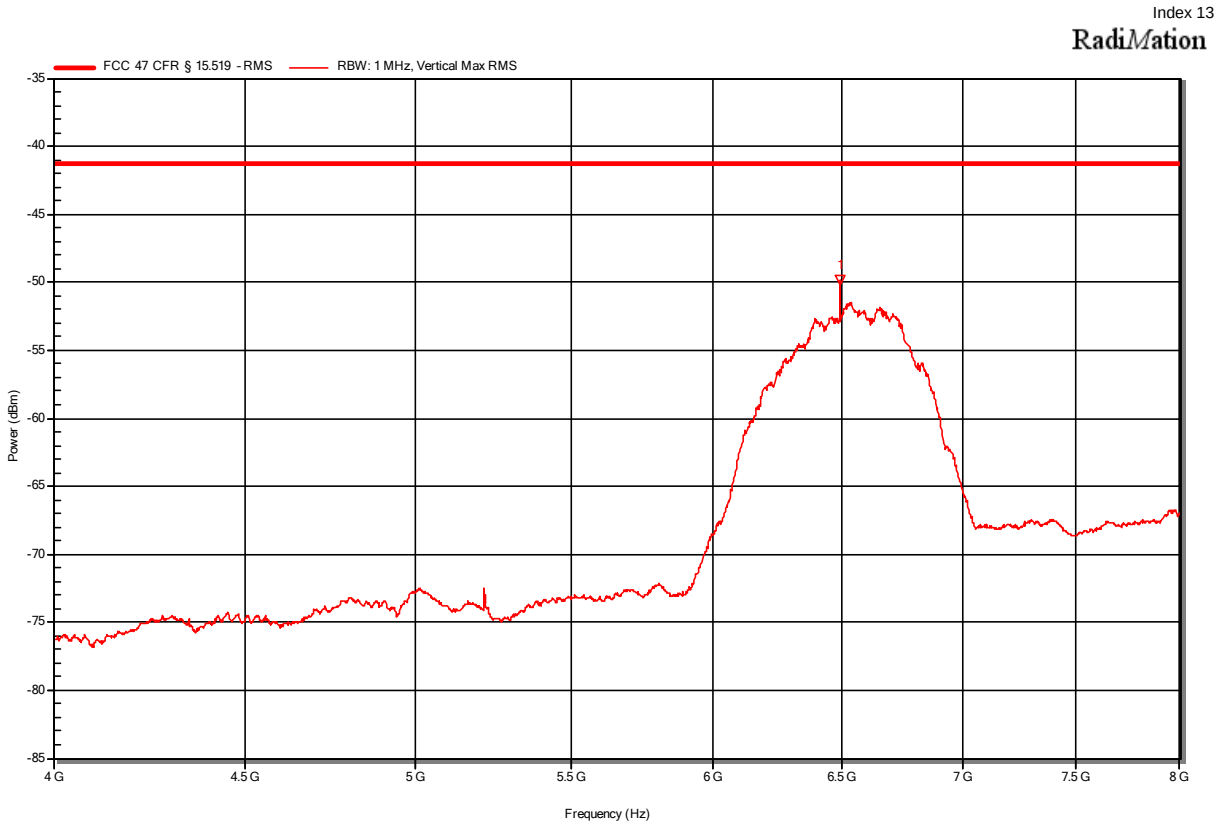
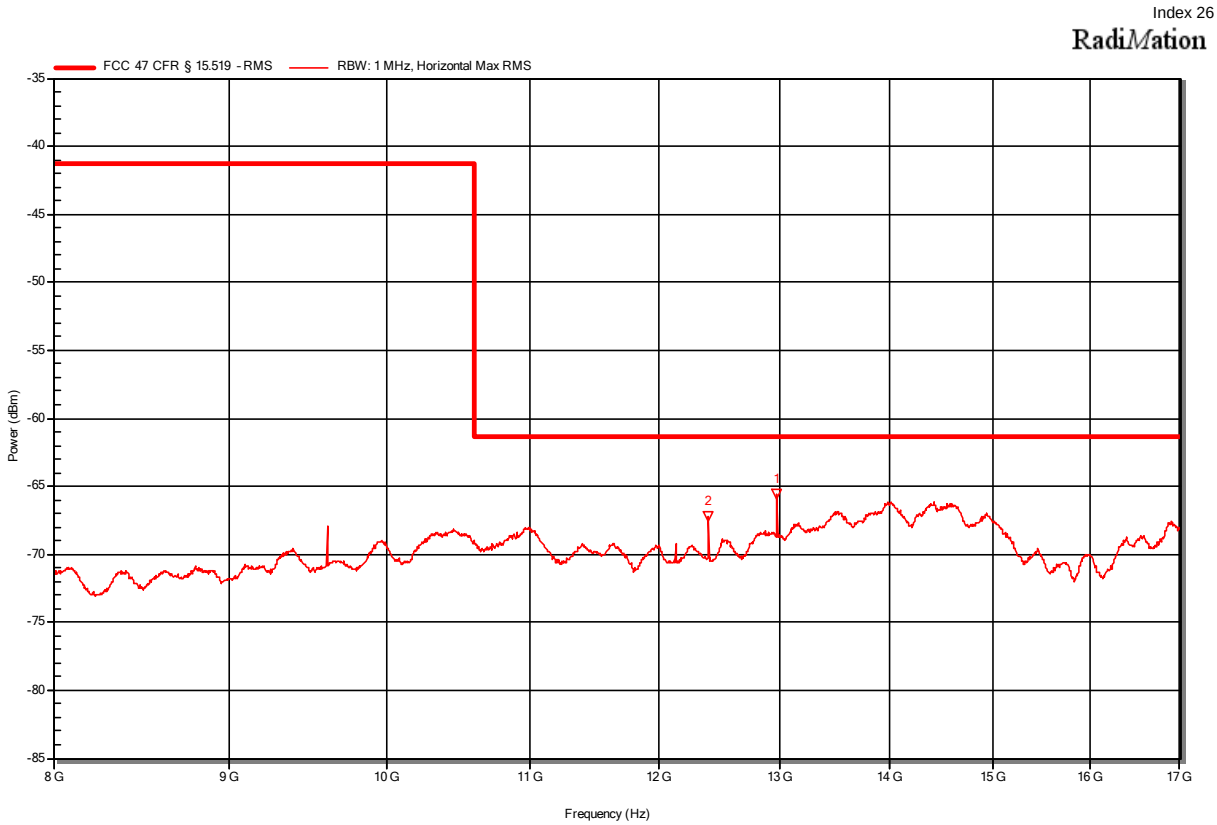
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT hor
Test Date:	Thursday, February 4, 2021
Note:	



Frequency	RMS	RMS Limit	RMS Difference	RMS Status
6.4899 GHz	-49.8 dBm	-41.3 dBm	-8.53 dB	Pass

Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT hor
Test Date:	Friday, February 5, 2021
Note:	



Frequency	RMS	RMS Limit	RMS Difference	RMS Status
12.3998 GHz	-67.2 dBm	-61.3 dBm	-5.92 dB	Pass
12.9797 GHz	-65.6 dBm	-61.3 dBm	-4.3 dB	Pass

Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

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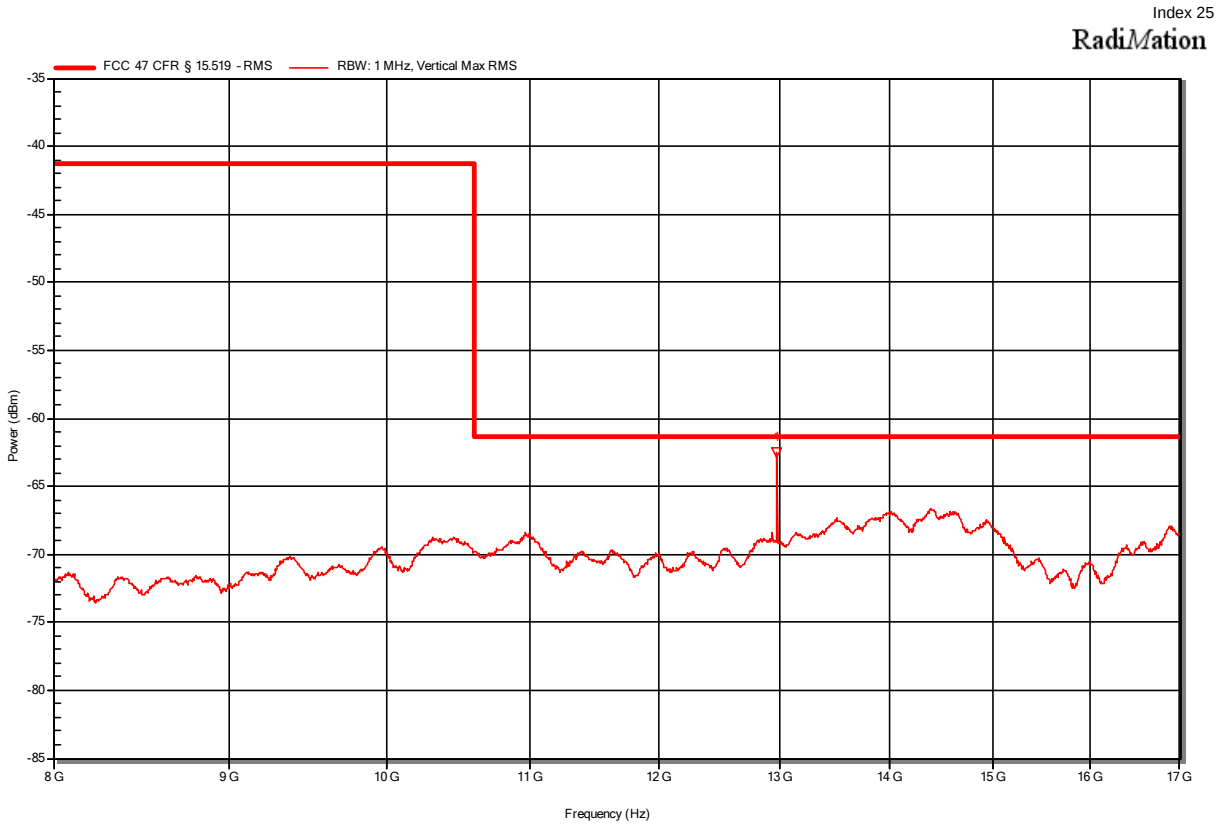
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT hor
Test Date:	Friday, February 5, 2021
Note:	



Frequency	RMS	RMS Limit	RMS Difference	RMS Status
12.9797 GHz	-62.5 dBm	-61.3 dBm	-1.24 dB	Pass

Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
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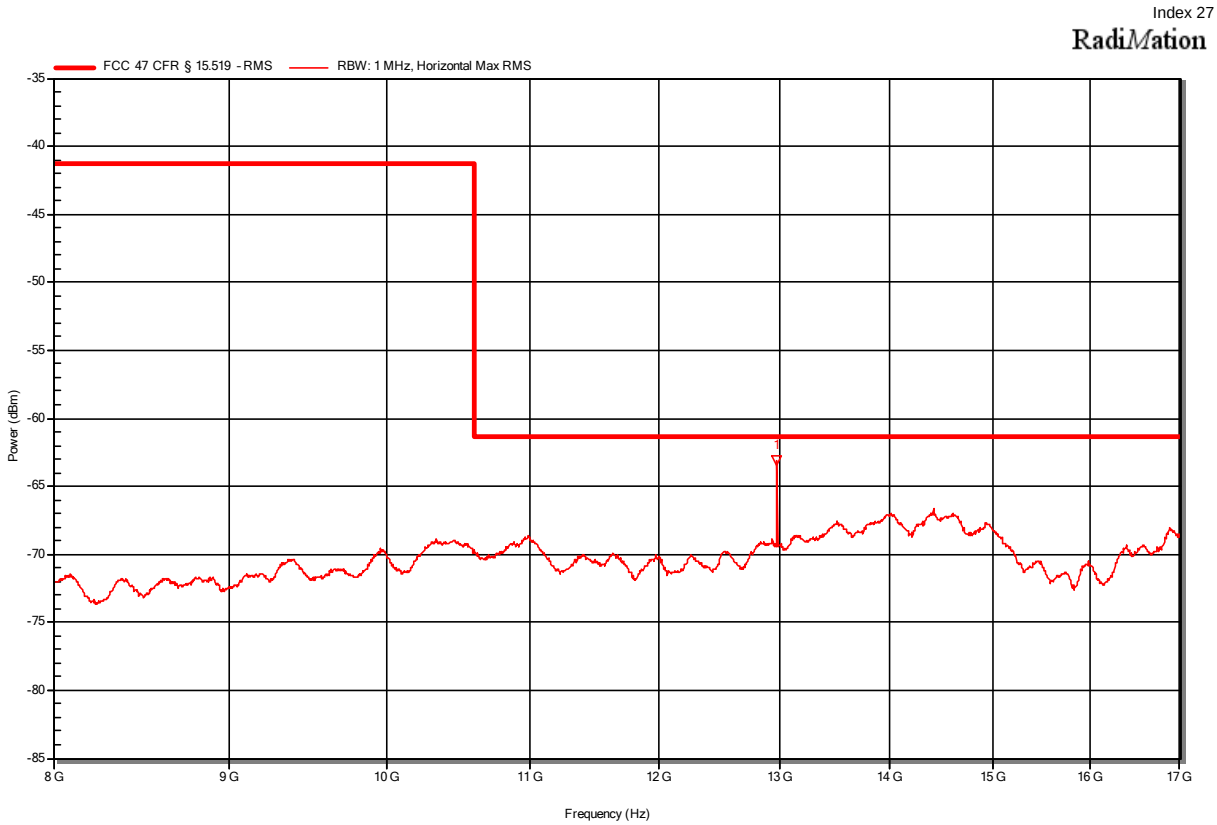
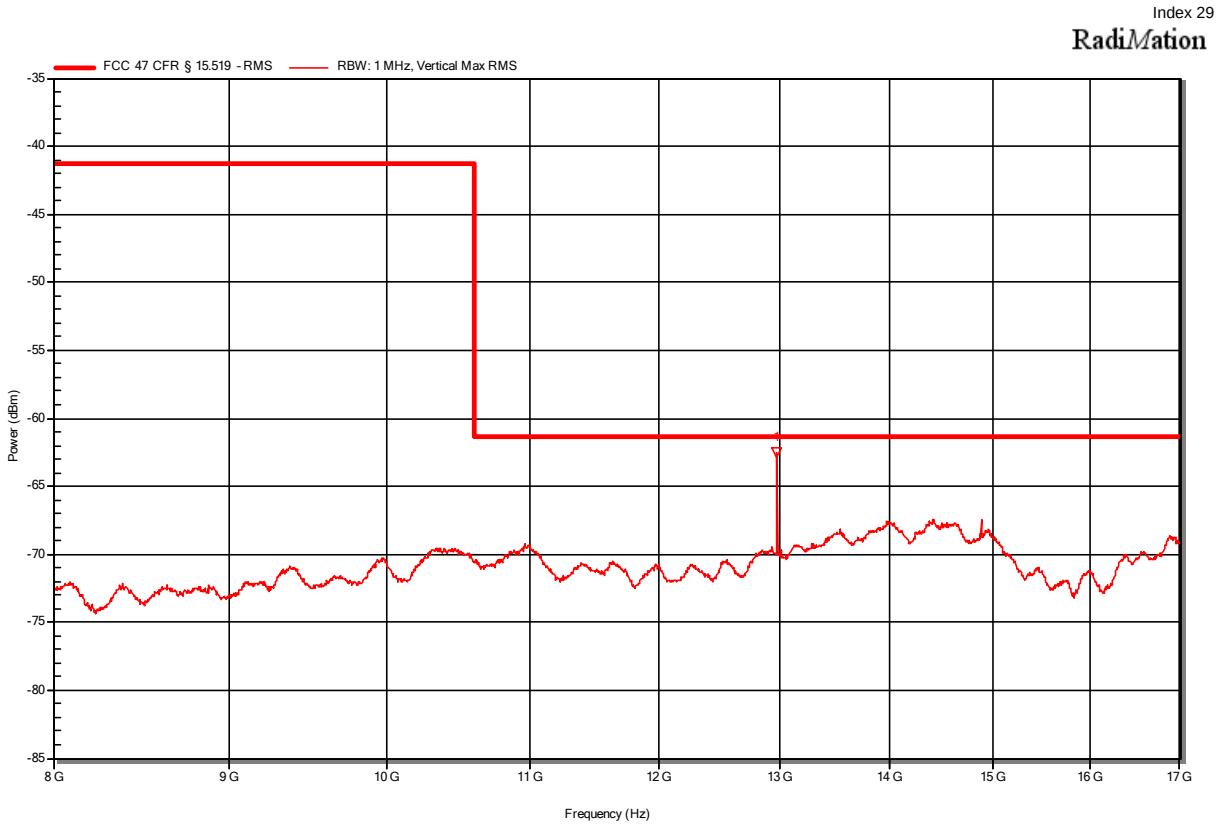
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT ver
Test Date:	Friday, February 5, 2021
Note:	



Frequency	RMS	RMS Limit	RMS Difference	RMS Status
12.9797 GHz	-63.2 dBm	-61.3 dBm	-1.87 dB	Pass

Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT ver
Test Date:	Friday, February 5, 2021
Note:	



Frequency	RMS	RMS Limit	RMS Difference	RMS Status
12.9797 GHz	-62.5 dBm	-61.3 dBm	-1.21 dB	Pass

Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

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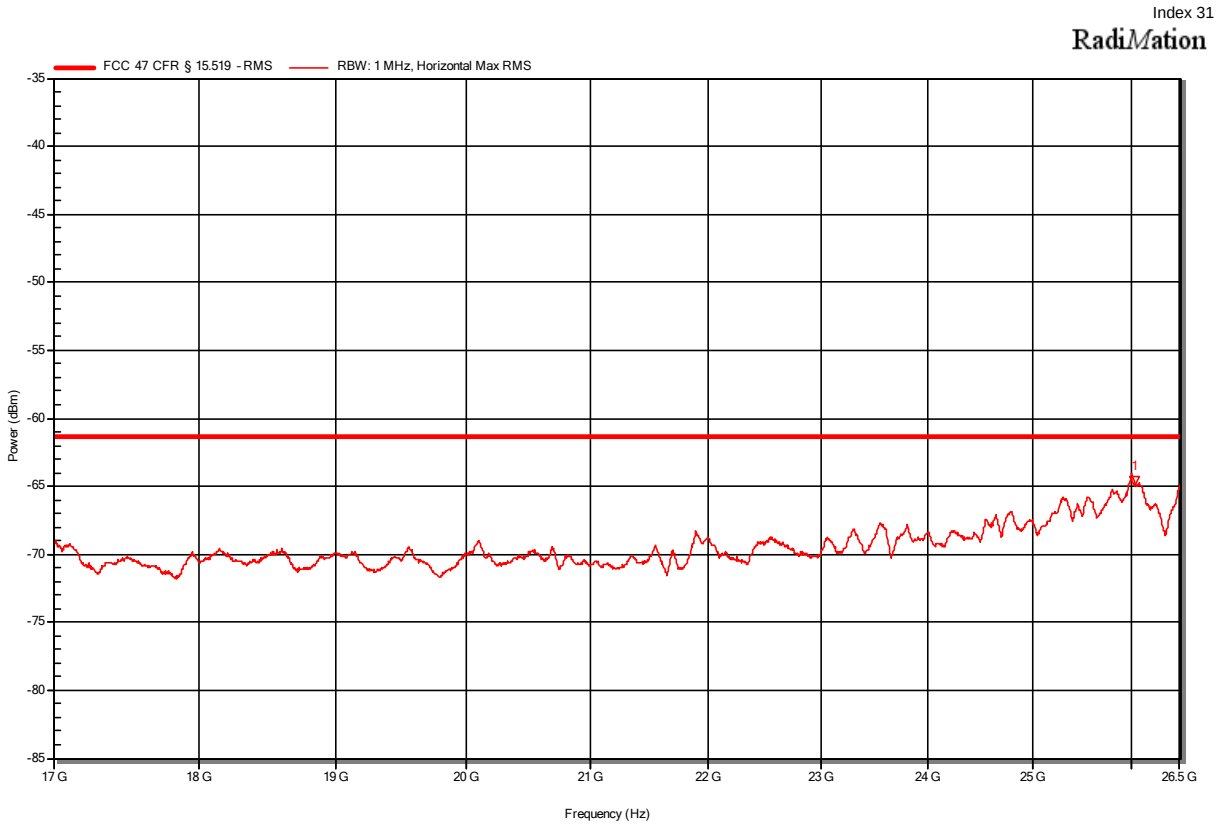
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Amplifier Research AT4560, Horizontal
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT ver
Test Date:	Friday, February 5, 2021
Note:	



Frequency	RMS	RMS Limit	RMS Difference	RMS Status
26.03 GHz	-64.6 dBm	-61.3 dBm	-3.31 dB	Pass

Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

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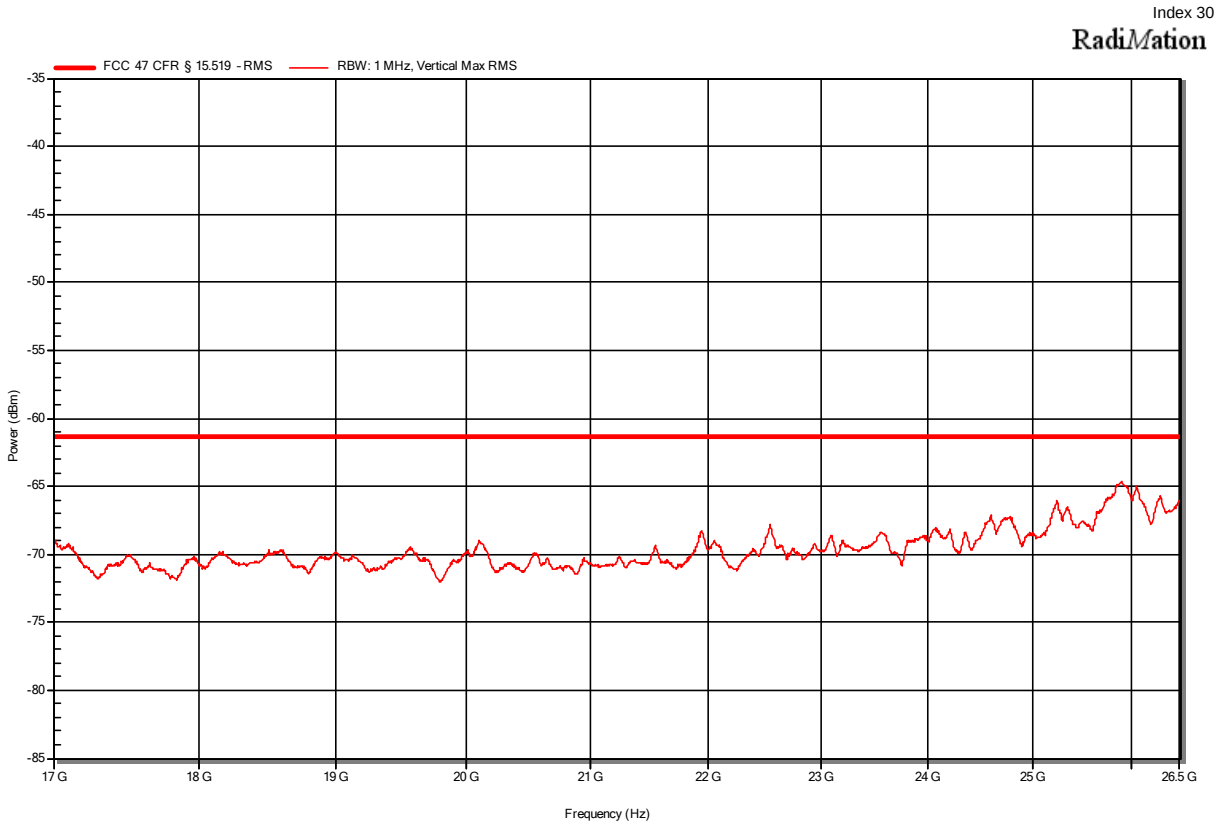
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Amplifier Research AT4560, Vertical
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT ver
Test Date:	Friday, February 5, 2021
Note:	



Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Flann Microwave Ltd 22240-25+CBL26402075, Horizontal
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT ver
Test Date:	Monday, February 8, 2021
Note:	

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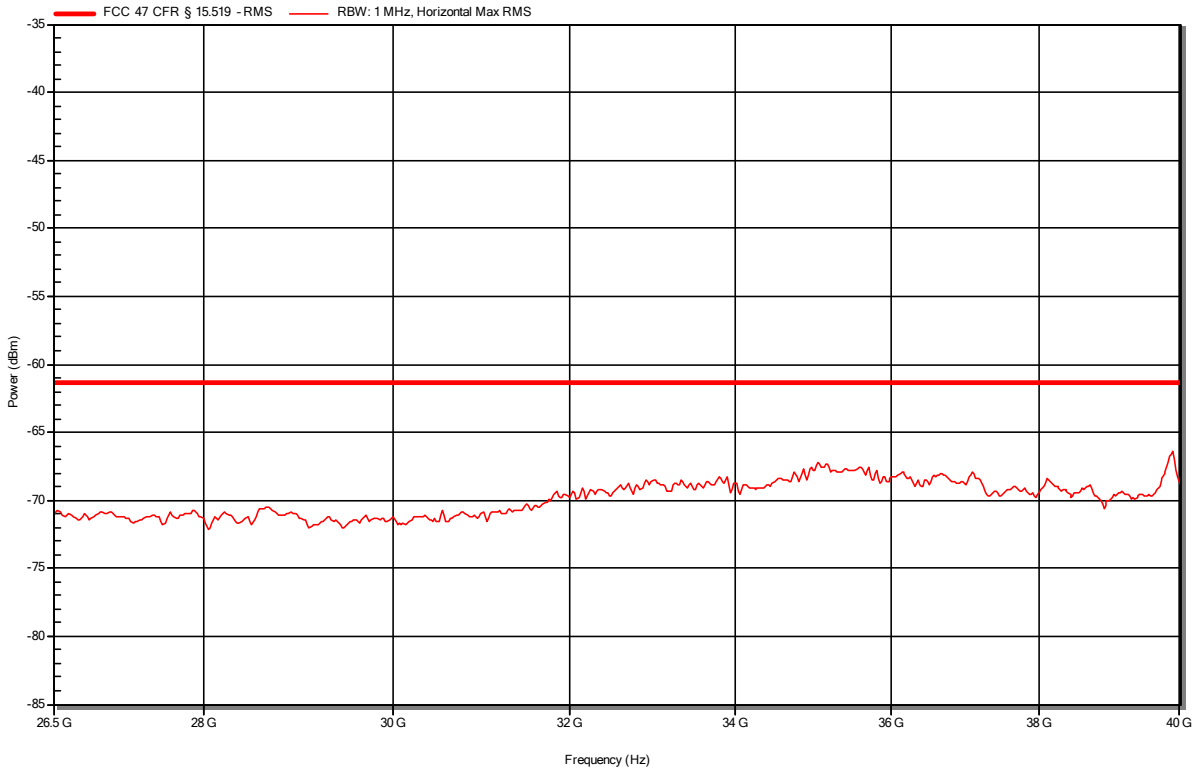
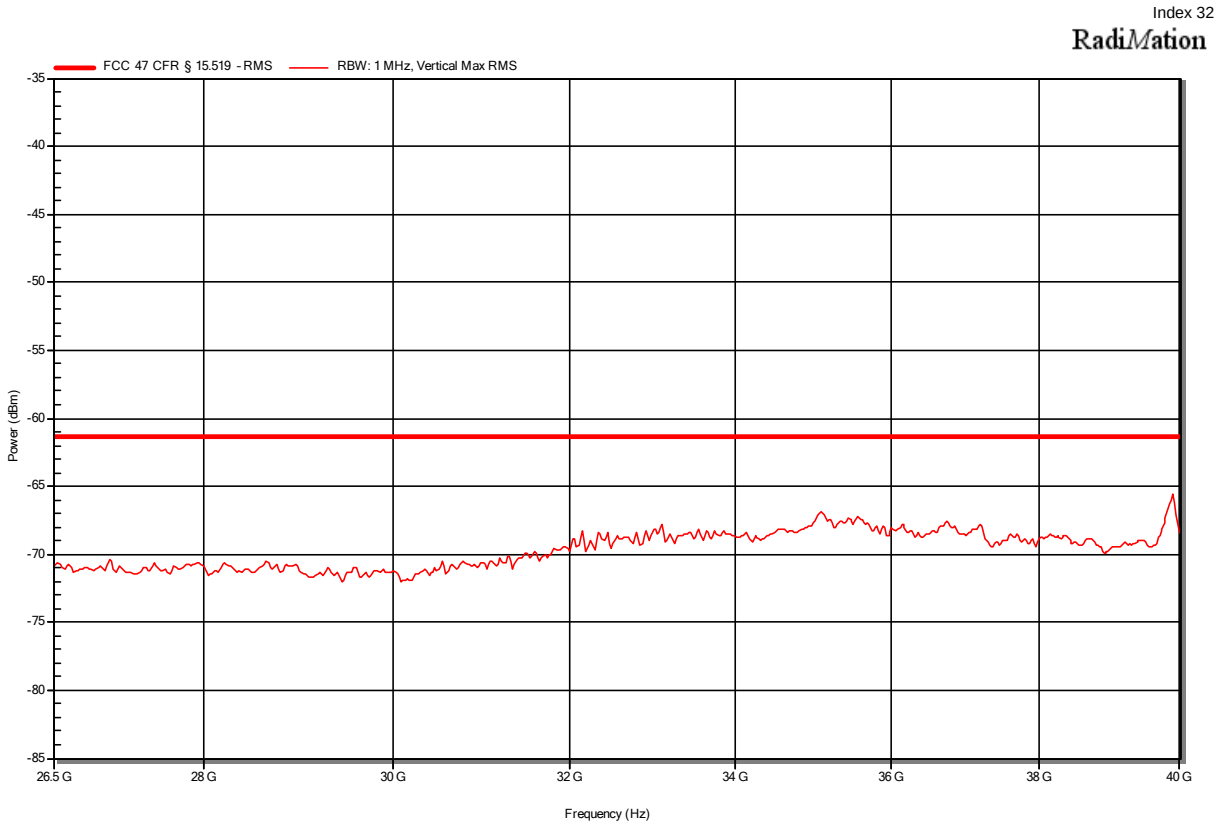
RadiMation



Radiated Spurious Emissions according to FCC 47 CFR Part 15 Subpart F

Project Number:	G0M-2012-9520
Applicant:	Tharsus Limited
Model Description:	RF Proximity Module
Model:	BUMP-718-F
Test Sample ID:	32508
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 3.7 VDC
Antenna:	Flann Microwave Ltd 22240-25+CBL26402075, Vertical
Measurement distance:	1 m
Mode:	Tx; UWB, Band 5, EUT ver
Test Date:	Monday, February 8, 2021
Note: