Report On

FCC and Industry Canada Testing of the
Laerdal Medical AS CPRmeter 2
In accordance with FCC 47 CFR Part 15C, Industry Canada RSS-247 and Industry Canada RSS-GEN

COMMERCIAL-IN-CONFIDENCE

FCC ID: QHQ-801002
IC: 20263-801002

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Document 75932076 Report 03 Issue 1

February 2016

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DATED 18 February 2016

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15C, Industry Canada RSS-247 and Industry Canada RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

M Choudhury G Lawler

UKAS TESTING 0141

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SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the
Laerdal Medical AS CPRmeter 2
In accordance with FCC 47 CFR Part 15C, Industry Canada RSS-247
and Industry Canada RSS-GEN

1.1 INTRODUCTION

The information contained in this report is intended to show the verification of FCC and Industry Canada Testing of the Laerdal Medical AS CPRmeter 2 to the requirements of FCC 47 CFR Part 15C and Industry Canada RSS-247.

Objective	To perform FCC and Industry Canada Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Laerdal Medical AS
Model Number(s)	CPRmeter 2
Serial Number(s)	Not serialised (75932076-TSR0001) C88396-0057
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 15C (2014) Industry Canada RSS-247 (Issue 1, 2015) Industry Canada RSS-GEN (Issue 4, November 2014)
Incoming Release Date	Application Form 12 October 2015
Disposal Date	Returned to customer 04 November 2015
Order Number Date	PTP 23 September 2015
Start of Test	14 October 2015
Finish of Test	20 October 2015
Name of Engineer(s)	M Choudhury G Lawler
Related Document(s)	ANSI C63.10: 2013

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1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15C, Industry Canada RSS-247 and Industry Canada RSS-GEN is shown below.

Section	Specification Clause			Test Description	Result	Comments/Base Standard
	Part 15C	RSS-247	RSS-GEN			
Bluetooth Low Energy						
2.1	15.247 (e)	5.2 (2)	-	Power Spectral Density	Pass	
2.2	15.247 (a)(2)	5.2(1)	-	6 dB Bandwidth	Pass	
2.3	15.247 (b)(3)	5.4(4)	-	Maximum Conducted Output Power	Pass	
2.4	15.247 (d), 15.205 and 15.209	5.5	-	Spurious Radiated Emissions	Pass	
2.5	15.205	-	8.10	Restricted Band Edges	Pass	
2.6	15.247 (d)	5.5	-	Authorised Band Edges	Pass	

Product Service

1.3 APPLICATION FORM

EQUIPMENT DESCRIPTION	
Model Name/Number	CPRmeter 2
Part Number	
FCC ID (if applicable)	QHQ-801002
Industry Canada ID (if applicable)	20263-801002
Technical Description (Please provide a brief description of the intended use of the equipment)	A device which trains users into administaring correct CPR. Post training data is downloaded from the device for analysis via a bluetooth low energy tranceiver

Types of Modulations used by the Equipment	
☒	FHSS
☐	Other forms of modulation
In case of FHSS Modulation	
In case of non-Adaptive Frequency Hopping equipment:	
	Number of Hopping Frequencies: Bluetooth Low energy has 40 channels
In case of Adaptive Frequency Hopping Equipment:	
	Maximum number of Hopping Frequencies:
	Minimum number of Hopping Frequencies:
Dwell Time:	
Minimum Channel Occupation Time:	
Adaptive / non-adaptive equipment:	
☐	non-adaptive Equipment
☒	adaptive Equipment without the possibility to switch to a non-adaptive mode
☐	adaptive Equipment which can also operate in a non-adaptive mode
In case of adaptive equipment:	
The Channel Occupancy Time implemented by the equipment: ms	
☐	The equipment has implemented an LBT based DAA mechanism
In case of equipment using modulation different from FHSS:	
☐	The equipment is Frame Based equipment
☐	The equipment is Load Based equipment
☐	The equipment can switch dynamically between Frame Based and Load Based equipment
The CCA time implemented by the equipment: µs	
☐	The equipment has implemented an non-LBT based DAA mechanism
☐	The equipment can operate in more than one adaptive mode

Product Service

In case of non-adaptive Equipment:		
The maximum RF Output Power (e.i.r.p.): 4 dBm		
The maximum (corresponding) Duty Cycle: %		
Equipment with dynamic behaviour, that behaviour is described here. (e.g. the different combinations of duty cycle and corresponding power levels to be declared):		
The worst case operational mode for each of the following tests:		
RF Output Power: BLE		
Power Spectral Density: BLE		
Duty cycle, Tx-Sequence, Tx-gap:		
Accumulated Transmit Time, Frequency Occupation & Hopping Sequence (only for FHSS equipment):		
Hopping Frequency Separation (only for FHSS equipment):		
Medium Utilisation:		
Adaptivity & Receiver Blocking:		
Nominal Channel Bandwidth: BLE		
Transmitter unwanted emissions in the OOB domain: BLE		
Transmitter unwanted emissions in the spurious domain: BLE		
Receiver spurious emissions: BLE		
The different transmit operating modes (tick all that apply):		
☒	Operating mode 1: Single Antenna Equipment	
	☒	Equipment with only 1 antenna
	☐	Equipment with 2 diversity antennas but only 1 antenna active at any moment in time
	☐	Smart Antenna Systems with 2 or more antennas, but operating in a (legacy) mode where only 1 antenna is used. (e.g. IEEE 802.11™ [2012] legacy mode in smart antenna systems)
☐	Operating mode 2: Smart Antenna Systems - Multiple Antennas without beam forming	
	☐	Single spatial stream / Standard throughput / (e.g. IEEE 802.11™ [2012] legacy mode)
	☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
	☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2
	☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 3
	☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 4
	☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 5
NOTE: Add more lines if more channel bandwidths are supported.		
☐	Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming	
	☐	Single spatial stream / Standard throughput (e.g. IEEE 802.11™ [2012] legacy mode)
	☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
	☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2
	☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 3
	☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 4
	☐	High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 5
NOTE: Add more lines if more channel bandwidths are supported.		

Product Service

In case of Smart Antenna Systems:
The number of Receive chains:
The number of Transmit chains:
☐ symmetrical power distribution
☐ asymmetrical power distribution
In case of beam forming, the maximum (additional) beam forming gain: dB
NOTE: The additional beam forming gain does not include the basic gain of a single antenna.
Operating Frequency Range(s) of the equipment:
Operating Frequency Range 1: 2400 MHz to 2483.5 MHz
Operating Frequency Range 2: MHz to MHz
Operating Frequency Range 3: MHz to MHz
NOTE: Add more lines if more Frequency Ranges are supported.
Nominal Channel Bandwidth(s):
Nominal Channel Bandwidth1: 2 MHz
Nominal Channel Bandwidth2: MHz
Nominal Channel Bandwidth3: MHz
Nominal Channel Bandwidth4: MHz
Nominal Channel Bandwidth5: MHz
NOTE: Add more lines if more channel bandwidths are supported.
Type of Equipment (stand-alone, combined, plug-in radio device, etc.):
☒ Stand-alone
☐ Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment)
☐ Plug-in radio device (Equipment intended for a variety of host systems)
☐ Other
The extreme operating conditions that apply to the equipment:
Operating temperature range: 0 °C to 40 °C
Details provided are for the:
☒ stand-alone equipment
☐ combined (or host) equipment
☐ test jig

Product Service

The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p levels:			
Antenna Type:			
☒ Integral Antenna			
Antenna Gain: peak gain is 1.7 dBi			
If applicable, additional beamforming gain (excluding basic antenna gain): dB			
☒ Temporary RF connector provided			
☐ No temporary RF connector provided			
☐ Dedicated Antennas (equipment with antenna connector)			
☐ Single power level with corresponding antenna(s)			
☐ Multiple power settings and corresponding antenna(s)			
Number of different Power Levels:			
Power Level 1: dBm			
Power Level 2: dBm			
Power Level 3: dBm			
NOTE 1: Add more lines in case the equipment has more power levels.			
NOTE 2: These power levels are conducted power levels (at antenna connector).			
For each of the Power Levels, provide the intended antenna assemblies, their corresponding gains (G) and the resulting e.i.r.p. levels also taking into account the beamforming gain (Y) if applicable			
Power Level 1: 4 dBm			
Number of antenna assemblies provided for this power level: 1			
Assembly #	**Gain (dBi)**	**e.i.r.p (dBm)**	**Part number or model number**
1	1.7	5.7	standalone
2			
3			
4			
NOTE: Add more rows in case more antenna assemblies are supported for this power level.			
Power Level 2: dBm			
Number of antenna assemblies provided for this power level:			
Assembly #	**Gain (dBi)**	**e.i.r.p (dBm)**	**Part number or model number**
1			
2			
3			
4			
NOTE: Add more rows in case more antenna assemblies are supported for this power level.			
Power Level 3: dBm			
Number of antenna assemblies provided for this power level:			
Assembly #	**Gain (dBi)**	**e.i.r.p (dBm)**	**Part number or model number**
1			
2			
3			
4			
NOTE: Add more rows in case more antenna assemblies are supported for this power level.			

Product Service

The nominal voltages of the stand-alone radio equipment or the nominal voltages of the combined (host) equipment or test jig in case of plug-in devices:	
Details provided are for the: ☒ stand-alone equipment	
☐ combined (or host) equipment	
☐ test jig	
Supply Voltage ☐ AC mains State AC voltage V	
☒ DC State DC voltage 5 V	
In case of DC, indicate the type of power source	
☐ Internal Power Supply	
☒ External Power Supply or AC/DC adapter	
☐ Battery	
☐ Other:	
Describe the test modes available which can facilitate testing:	
You can select which channel, what output power, whether you want it modulated among other settings.	
The equipment type (e.g. Bluetooth®, IEEE 802.11™ [2012] IEEE 802.15.4™ [2011], proprietary, etc.):	
Bluetooth Low Energy	
If applicable, the statistical analysis referred in clause 5.3.1 q)	
To be provided as separate attachment, please state document name:	
If applicable, the statistical analysis referred in clause 5.3.1 r)	
To be provided as separate attachment, please state document name:	
Geo-location capability supported by the equipment:	
☐ Yes	
☐ The geographical location determined by the equipment as defined in clause 4.3.1.13.2 or clause 4.3.2.12.2 is not accessible to the user.	
☐ No	
Combination for testing (see clause 5.1.3.3 of EN 300 328 V1.9.1)	
From all combinations of conducted power settings and intended antenna assembly(ies) specified in clause 3.1 m), specify the combination resulting in the highest e.i.r.p. for the radio equipment. Unless otherwise specified in ETSI EN 300 328, this power setting is to be used for testing against the requirements of ETSI EN 300 328. In case there is more than one such conducted power setting resulting in the same (highest) e.i.r.p. level, the highest power setting is to be used for testing. See also ETS EN 300 328, clause 5.1.3.3.	
Highest overall e.i.r.p. value: dBm	
Corresponding Antenna assembly gain: dBi	Antenna Assembly #:
Corresponding conducted power setting: dB (also the power level to be used for testing)	Listed as Power Setting #:
Additional information provided by the applicant	
Modulation	
ITU Class(es) of emission:	
Can the transmitter operate unmodulated? ☐ Yes ☐ No	
Duty Cycle	
The transmitter is intended for:	
☐ Continuous duty	
☐ Intermittent duty	
☐ Continuous operation possible for testing purposes	

Product Service

	About the UUT
☒	The equipment submitted are representative production models
☐	If not, the equipment submitted are pre-production models?
☐	If pre-production equipment are submitted, the final production equipment will be identical in all respects with the equipment tested
☐	If not, supply full details
☐	The equipment submitted is CE marked
☐	In addition to the CE mark, the Class-II identifier (Alert Sign) is affixed.
	Additional items and/or supporting equipment provided
☐	Spare batteries (e.g. for portable equipment)
☐	Battery charging device
☐	External Power Supply or AC/DC adapter
☐	Test Jig or interface box
☐	RF test fixture (for equipment with integrated antennas)
☐	Host System
	Manufacturer
	Model
	Model Name
☐	Combined equipment
	Manufacturer
	Model
	Model Name
☐	User Manual
☒	Technical documentation (Handbook and circuit diagrams)

I hereby declare that I am entitled to sign on behalf of the applicant and that the information supplied is correct and complete.

Name: Hefin Evans

Position held: Lead Electronics Consultant Date: 12-October-2015

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Laerdal Medical AS CPRmeter 2. A full technical description can be found in the manufacturer's documentation.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure.

The EUT was powered from a 5 V DC supply.

FCC Measurement Facility Registration Number
90987 Octagon House, Fareham Test Laboratory

Industry Canada Company Address Code
IC2932B-1 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard were made during testing.

1.7 MODIFICATION RECORD

Modification 0 - No modifications were made to the test sample during testing.

Product Service

SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the
Laerdal Medical AS CPRmeter 2
In accordance with FCC 47 CFR Part 15C, Industry Canada RSS-247
and Industry Canada RSS-GEN

2.1 POWER SPECTRAL DENSITY

2.1.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (e)
Industry Canada RSS-247, Clause 5.2 (2)

2.1.2 Equipment Under Test and Modification State

CPRmeter 2 S/N: Not serialised (75932076-TSR0001) - Modification State 0

2.1.3 Date of Test

14 October 2015

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Procedure

The test was performed in accordance with KDB 558074 D01 V03r02, clause 10.2 and Industry Canada RSS-247, clause 5.4(4).

2.1.6 Environmental Conditions

Ambient Temperature	23.7°C
Relative Humidity	33.8%

Product Service

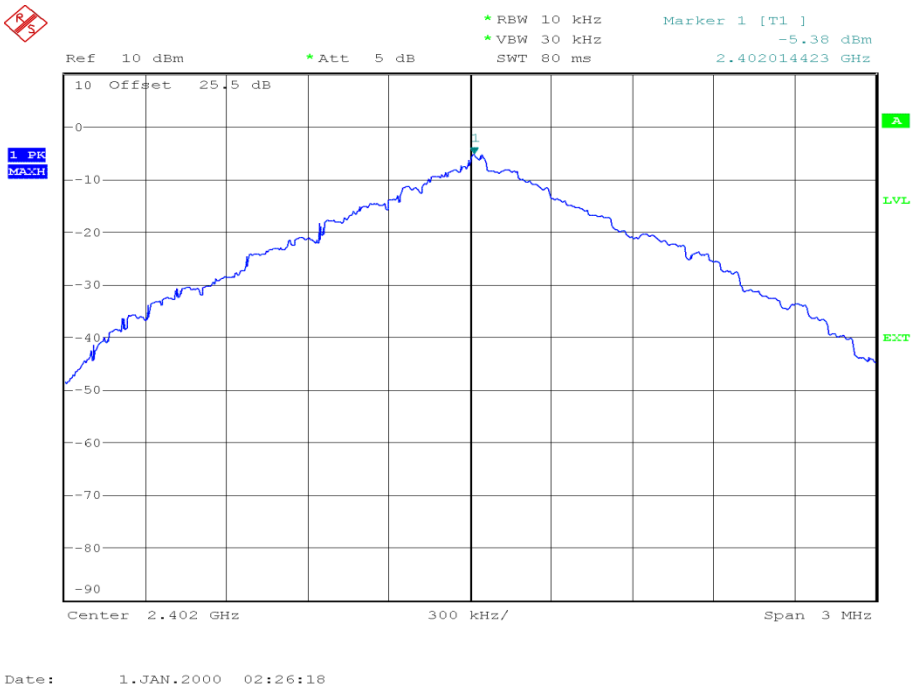
2.1.7 Test Results

5 V DC Supply

Bluetooth Low Energy, GFSK, Power Spectral Density Results

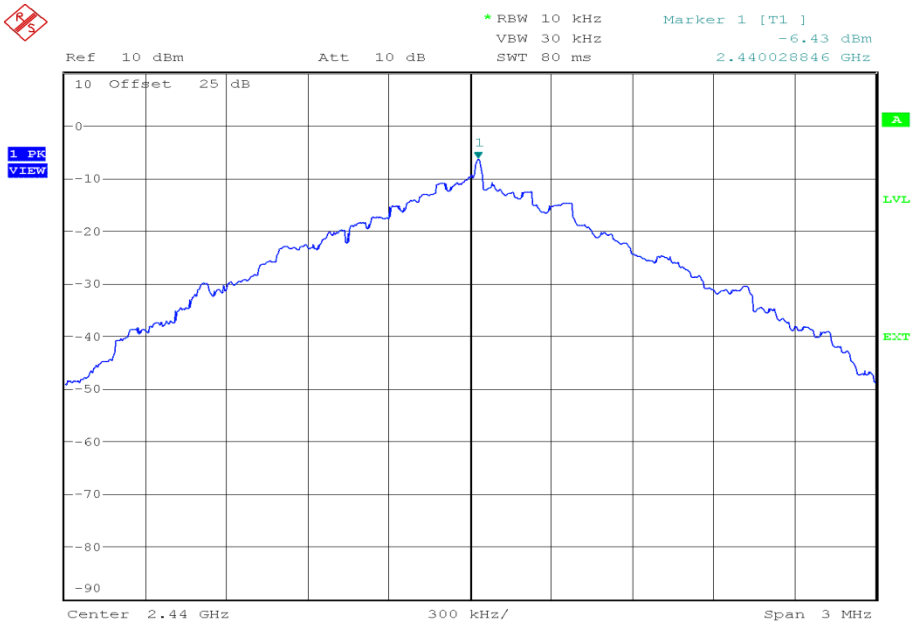
2402 MHz	2440 MHz	2480 MHz
dBm	dBm	dBm
-5.38	-6.43	-8.35

Bluetooth Low Energy, 2402 MHz, GFSK, Power Spectral Density Plot



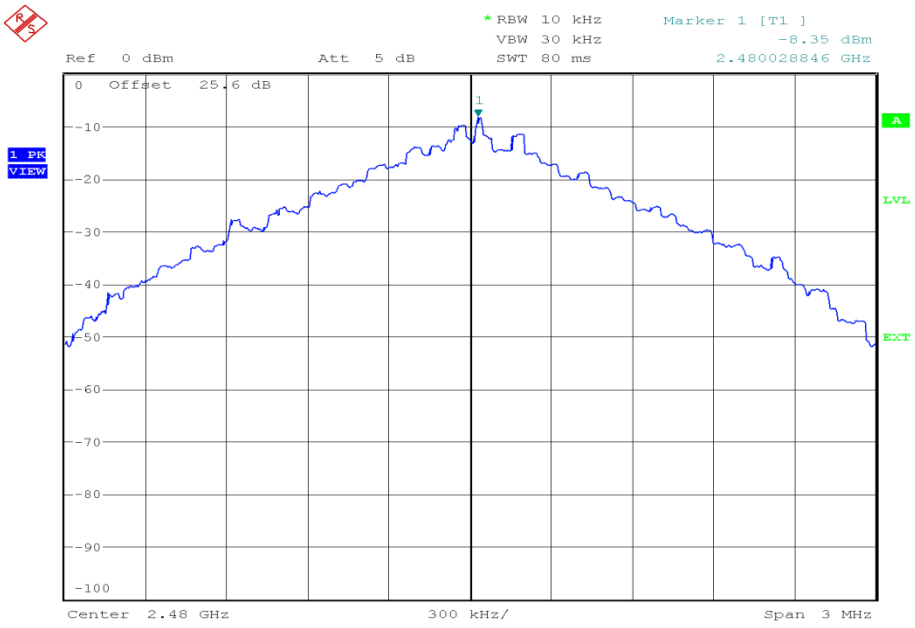
Product Service

Bluetooth Low Energy, 2440 MHz, GFSK, Power Spectral Density Plot



Date: 1.JAN.2000 03:18:02

Bluetooth Low Energy, 2480 MHz, GFSK, Power Spectral Density Plot



Date: 1.JAN.2000 03:22:54

FCC 47 CFR Part 15, Limit Clause 15.247 (e)

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Industry Canada RSS-247, Limit Clause, 5.2 (2)

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

2.2 6 dB BANDWIDTH

2.2.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (a)(2)
Industry Canada RSS-247, Clause 5.2(1)

2.2.2 Equipment Under Test and Modification State

CPRmeter 2 S/N: Not serialised (75932076-TSR0001) - Modification State 0

2.2.3 Date of Test

14 October 2015 & 16 October 2015

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Procedure

The test was performed in accordance with KDB 558074 D01 v03 r02, clause 8.1 and Industry Canada RSS-GEN, clause 6.6.

2.2.6 Environmental Conditions

Ambient Temperature	23.7 - 24.4°C
Relative Humidity	33.8 - 38.3%

Product Service

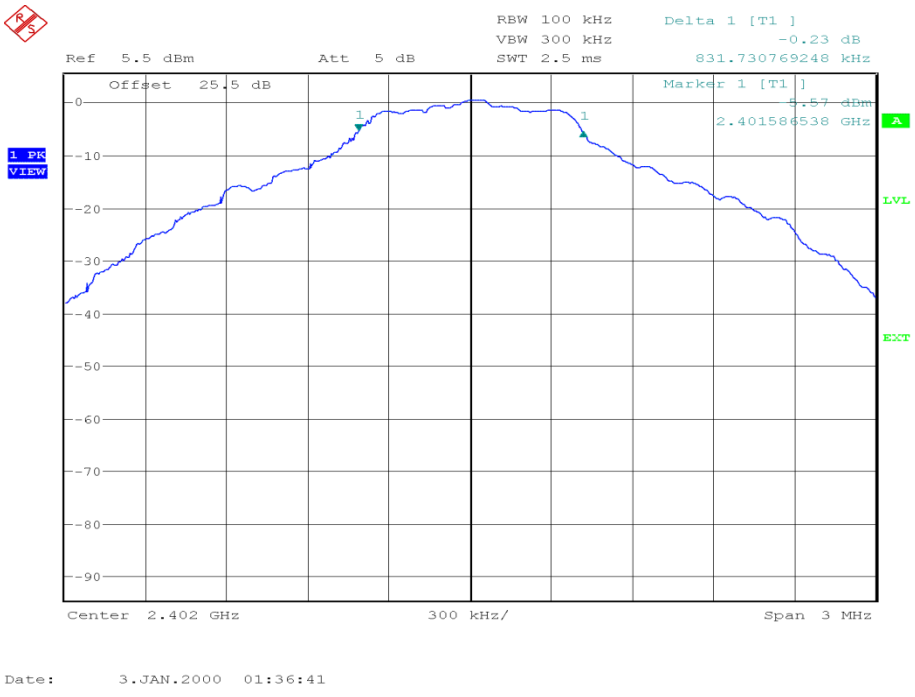
2.2.7 Test Results

5 V DC Supply

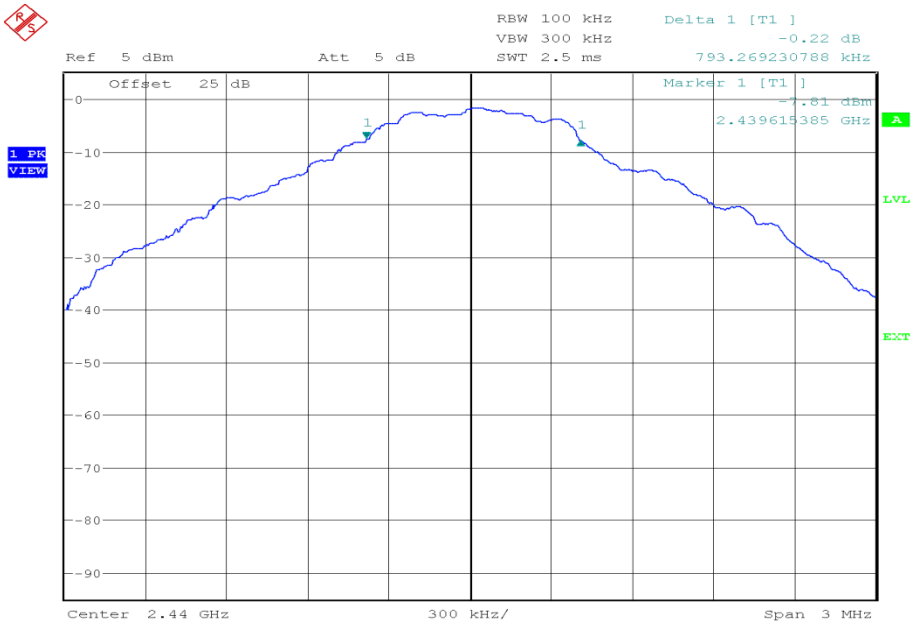
Bluetooth Low Energy, GFSK, 6 dB Bandwidth Results

2402 MHz	2440 MHz	2480 MHz
kHz	kHz	kHz
831.731	793.269	884.615

Bluetooth Low Energy, 2402 MHz, GFSK, 6 dB Bandwidth Plot

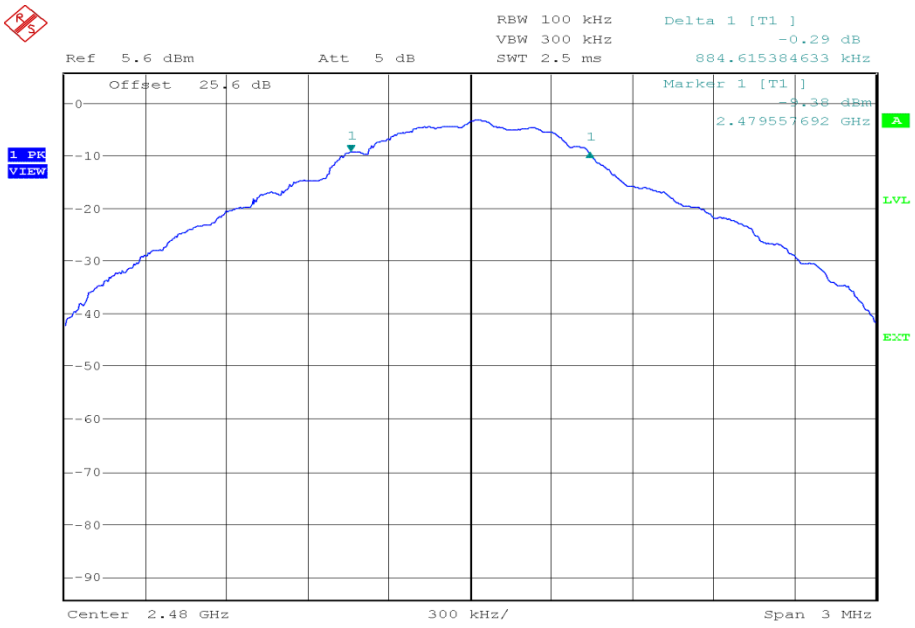


Bluetooth Low Energy, 2440 MHz, GFSK, 6 dB Bandwidth Plot



Date: 3.JAN.2000 01:43:54

Bluetooth Low Energy, 2480 MHz, GFSK, 6 dB Bandwidth Plot



Date: 3.JAN.2000 01:48:29

FCC 47 CFR Part 15, Limit Clause 15.247 (a)(2)

The minimum 6 dB Bandwidth shall be at least 500 kHz.

Industry Canada RSS-247, Limit Clause, 5.2(1)

The minimum 6 dB bandwidth shall be 500 kHz.

2.3 MAXIMUM CONDUCTED OUTPUT POWER

2.3.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (b)(3)
Industry Canada RSS-247, Clause 5.4(4)

2.3.2 Equipment Under Test and Modification State

CPRmeter 2 S/N: Not serialised (75932076-TSR0001) - Modification State 0

2.3.3 Date of Test

20 October 2015

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Procedure

The test was performed in accordance with KDB 558074 D01 v03r02, clause 9.1.1 and Industry Canada RSS-GEN, clause 6.12.

2.3.6 Environmental Conditions

Ambient Temperature	24.5°C
Relative Humidity	40.3%

2.3.7 Test Results

5 V DC Supply

Bluetooth Low Energy, Maximum Conducted Output Power Results

2402 MHz		2440 MHz		2480 MHz	
dBm	mW	dBm	mW	dBm	mW
2.09	1.6180800376	0.50	1.1220184543	0.07	1.0162486929

FCC 47 CFR Part 15, Limit Clause 15.247 (b)(3)

The maximum peak conducted output power of the intentional radiator shall not exceed the following:

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

Industry Canada RSS-247, Limit Clause, 5.4(4)

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

2.4 SPURIOUS RADIATED EMISSIONS

2.4.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (d), 15.205 and 15.209
Industry Canada RSS-247, Clause 5.5

2.4.2 Equipment Under Test and Modification State

CPRmeter 2 S/N: C88396-0057 - Modification State 0

2.4.3 Date of Test

19 October 2015 & 20 October 2015

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Test Procedure

The test was performed in accordance with and ANSI C63.10, clauses 11.11 and 11.12.1

2.4.6 Environmental Conditions

Ambient Temperature	20.3 - 20.6°C
Relative Humidity	37.0 - 43.0%

Product Service

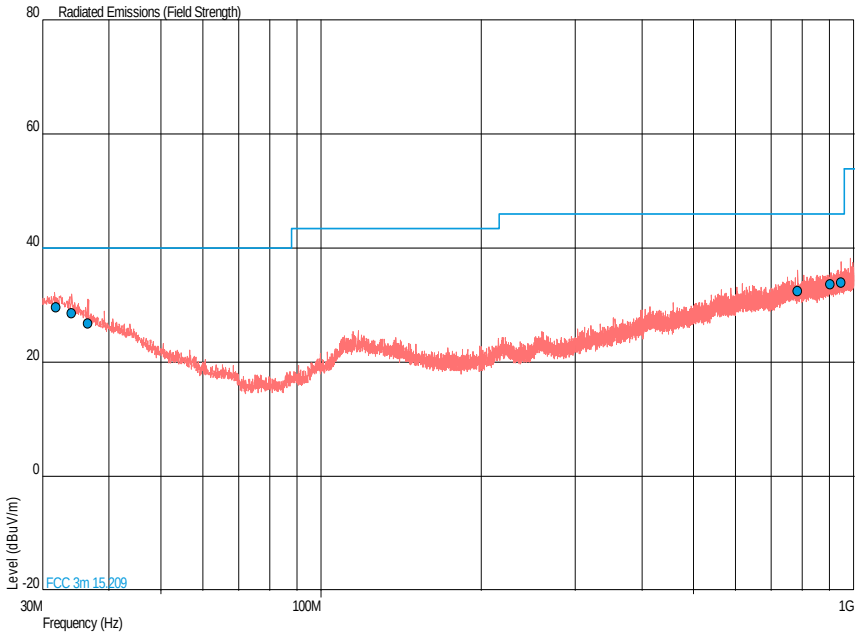
2.4.7 Test Results

5 V DC Supply

Bluetooth Low Energy, 2402 MHz, 30 MHz to 1 GHz, Spurious Radiated Emissions Results

Frequency (MHz)	QP Level (dBµV/m)	QP Margin (dBµV/m)	QP Level (µV/m)	QP Margin (µV/m)	Angle (°)	Height (m)	Polarisation
31.795	29.6	-10.4	30.2	-69.8	90	1.00	Vertical
34.074	28.6	-11.4	26.9	-73.1	270	1.00	Vertical
36.499	26.8	-13.2	21.9	-78.1	180	1.00	Horizontal
783.933	32.5	-13.5	42.2	-157.8	180	1.00	Horizontal
902.321	33.7	-12.3	48.4	-151.6	90	1.00	Horizontal
945.923	34.0	-12.0	50.1	-149.9	90	1.00	Vertical

Bluetooth Low Energy, 2402 MHz, 30 MHz to 1 GHz, Spurious Radiated Emissions Plot

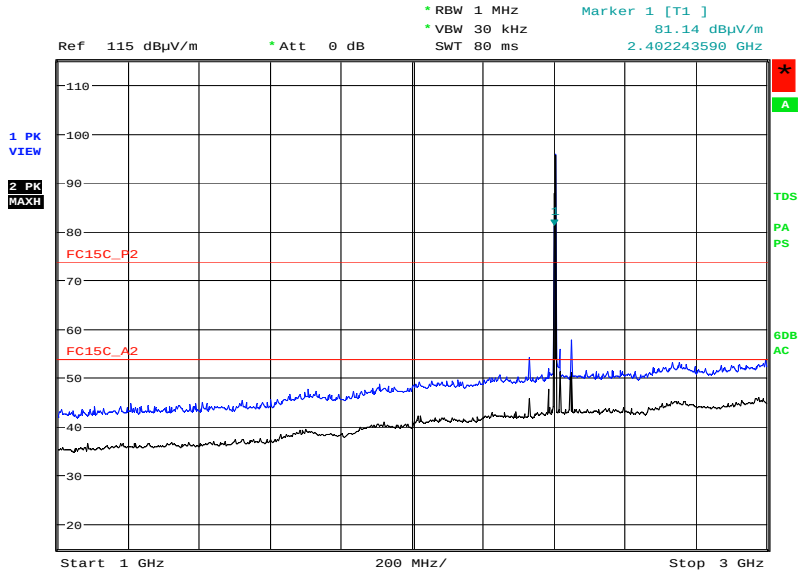


Bluetooth Low Energy, 2402 MHz, 1 GHz to 25 GHz, Spurious Radiated Emissions Results

Frequency (MHz)	Final Peak (dBµV/m)	Final Average (dBµV/m)	Final Peak (µV/m)	Final Average (µV/m)	Angle (°)	Height (m)	Polarisation
*							

*No emissions were detected within 10 dB of the limit.

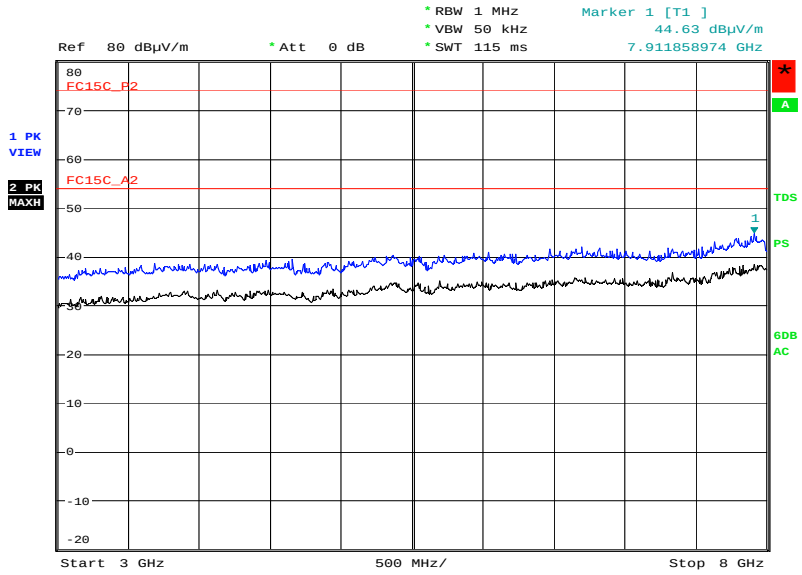
Bluetooth Low Energy, 2402 MHz, 1 GHz to 3 GHz, Spurious Radiated Emissions Plot



Date: 19.OCT.2015 20:34:13

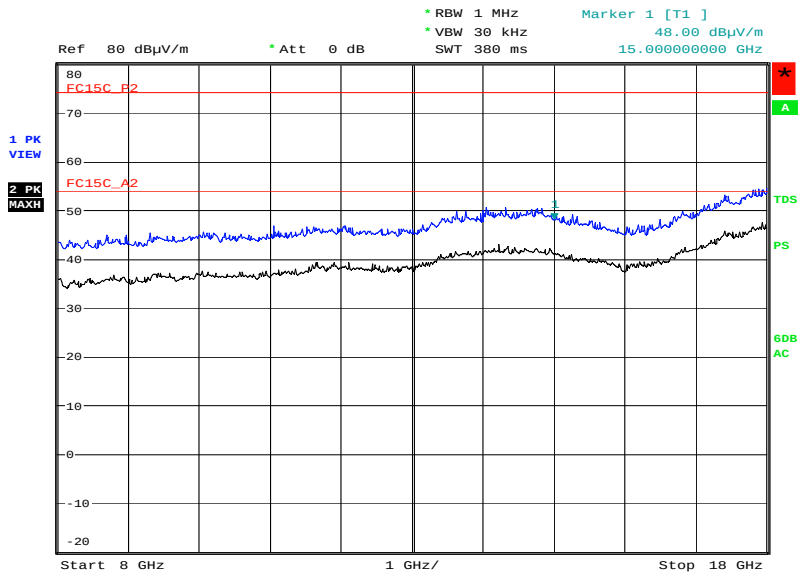
Product Service

Bluetooth Low Energy, 2402 MHz, 3 GHz to 8 GHz, Spurious Radiated Emissions Plot



Date: 19.OCT.2015 21:30:50

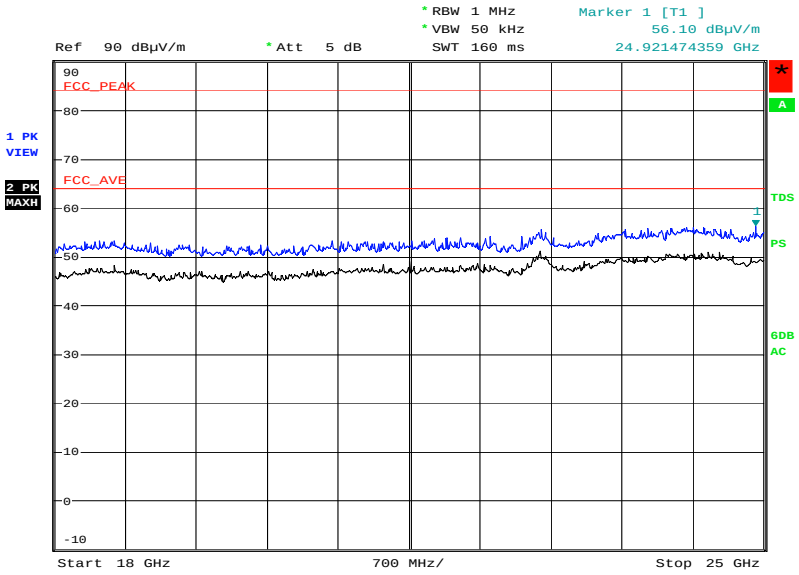
Bluetooth Low Energy, 2402 MHz, 8 GHz to 18 GHz, Spurious Radiated Emissions Plot



Date: 19.OCT.2015 21:46:37

Product Service

Bluetooth Low Energy, 2402 MHz, 18 GHz to 25 GHz, Spurious Radiated Emissions Plot



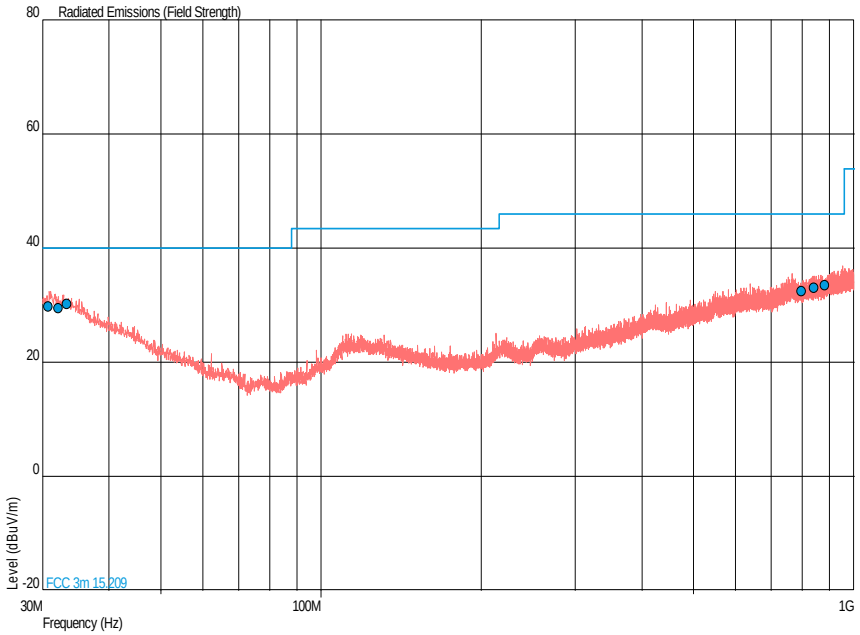
Date: 20.OCT.2015 22:29:15

Product Service

Bluetooth Low Energy, 2440 MHz, 30 MHz to 1 GHz, Spurious Radiated Emissions Results

Frequency (MHz)	QP Level (dBµV/m)	QP Margin (dBµV/m)	QP Level (µV/m)	QP Margin (µV/m)	Angle (°)	Height (m)	Polarisation
30.776	29.7	-10.3	30.5	-69.5	0	1.00	Horizontal
32.183	29.5	-10.5	29.9	-70.1	180	1.00	Horizontal
33.347	30.2	-9.8	32.4	-67.6	90	1.00	Vertical
796.203	32.5	-13.5	42.2	-157.8	180	1.00	Vertical
842.133	33.0	-13.0	44.7	-155.3	180	1.00	Horizontal
881.660	33.5	-12.5	47.3	-152.7	180	1.00	Vertical

Bluetooth Low Energy, 2440 MHz, 30 MHz to 1 GHz, Spurious Radiated Emissions Plot



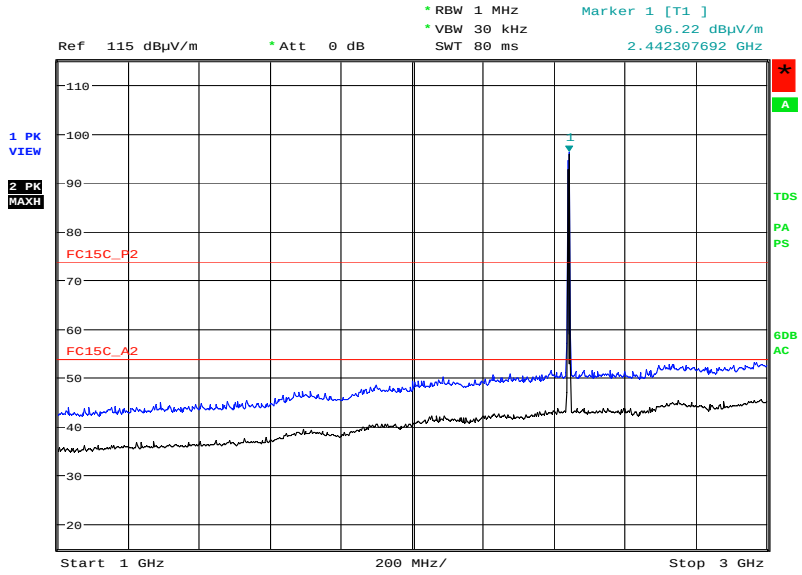
Product Service

Bluetooth Low Energy, 2440 MHz, 1 GHz to 25 GHz, Spurious Radiated Emissions Results

Frequency (MHz)	Final Peak (dBµV/m)	Final Average (dBµV/m)	Final Peak (µV/m)	Final Average (µV/m)	Angle (°)	Height (m)	Polarisation
*							

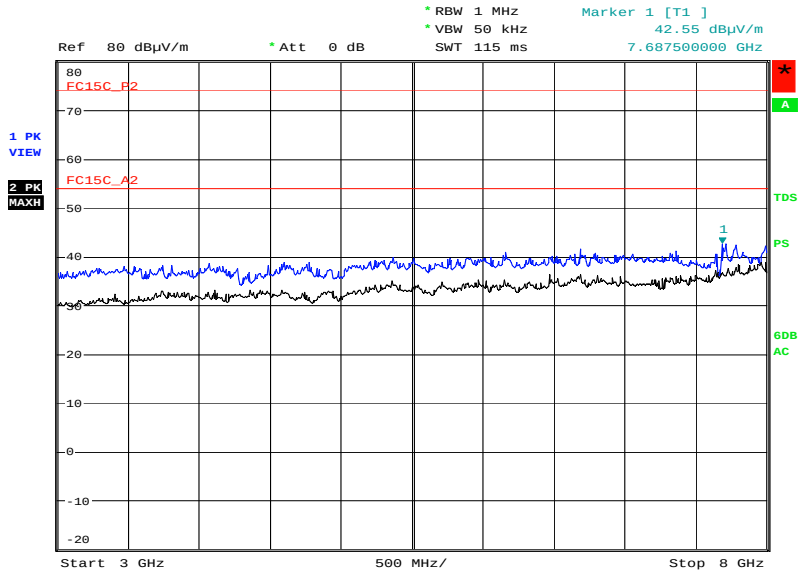
*No emissions were detected within 10 dB of the limit.

Bluetooth Low Energy, 2440 MHz, 1 GHz to 3 GHz, Spurious Radiated Emissions Plot



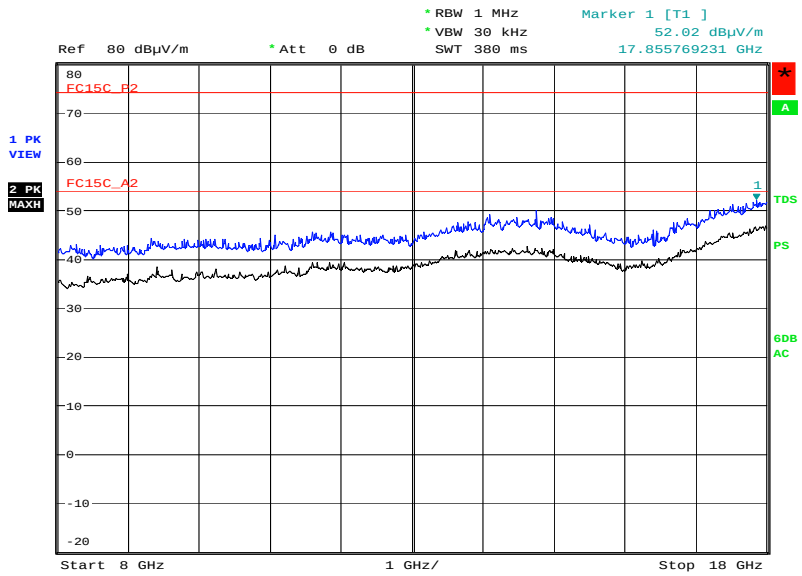
Product Service

Bluetooth Low Energy, 2440 MHz, 3 GHz to 8 GHz, Spurious Radiated Emissions Plot



Date: 19.OCT.2015 21:25:09

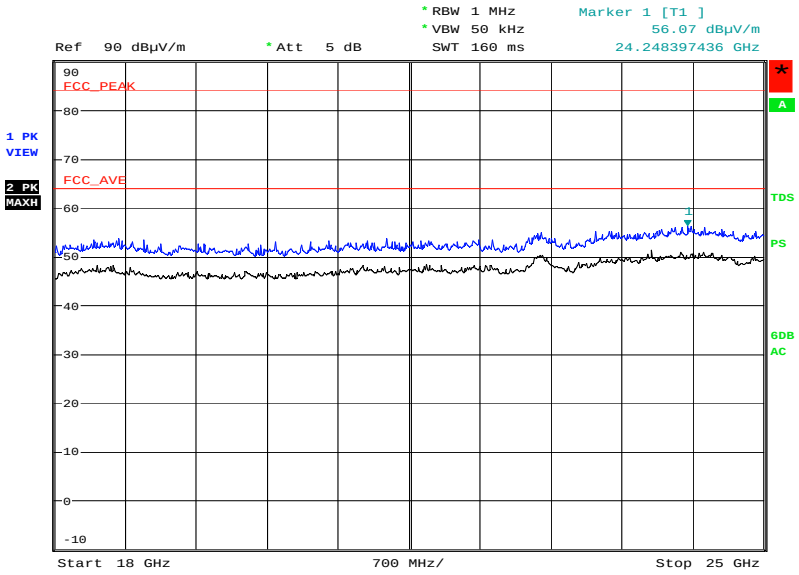
Bluetooth Low Energy, 2440 MHz, 8 GHz to 18 GHz, Spurious Radiated Emissions Plot



Date: 19.OCT.2015 22:00:27

Product Service

Bluetooth Low Energy, 2440 MHz, 18 GHz to 25 GHz, Spurious Radiated Emissions Plot



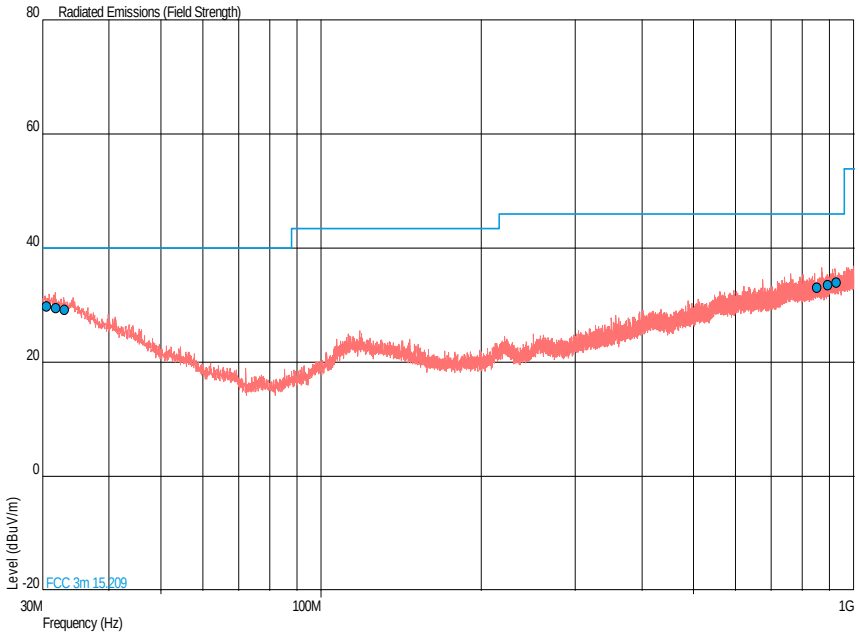
Date: 20.OCT.2015 22:39:39

Product Service

Bluetooth Low Energy, 2480 MHz, 30 MHz to 1 GHz, Spurious Radiated Emissions Results

Frequency (MHz)	QP Level (dBµV/m)	QP Margin (dBµV/m)	QP Level (µV/m)	QP Margin (µV/m)	Angle (°)	Height (m)	Polarisation
30.534	29.7	-10.3	30.5	-69.5	90	1.00	Vertical
31.795	29.5	-10.5	29.9	-70.1	0	1.00	Vertical
33.056	29.2	-10.8	28.8	-71.2	0	1.00	Horizontal
852.754	33.1	-12.9	45.2	-154.8	0	1.00	Vertical
892.088	33.5	-12.5	47.3	-152.7	90	1.00	Horizontal
926.523	34.0	-12.0	50.1	-149.9	270	1.00	Vertical

Bluetooth Low Energy, 2480 MHz, 30 MHz to 1 GHz, Spurious Radiated Emissions Plot

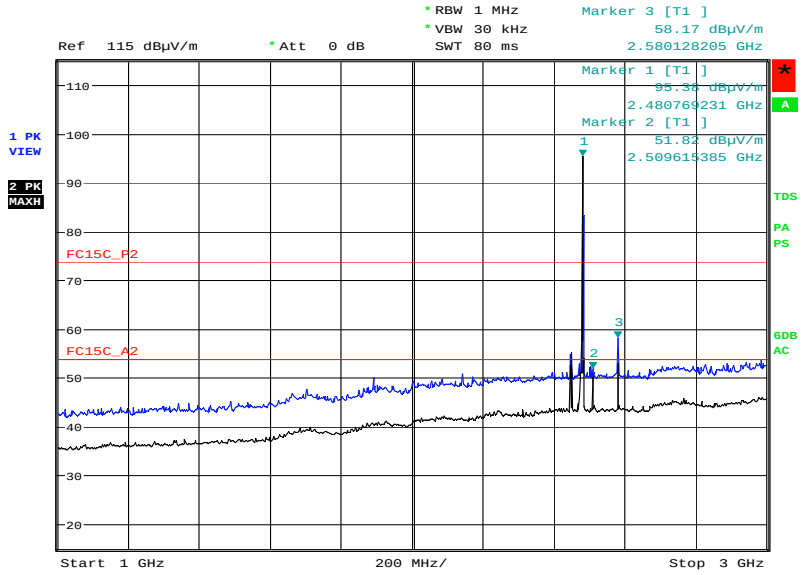


Bluetooth Low Energy, 2480 MHz, 1 GHz to 25 GHz, Spurious Radiated Emissions Results

Frequency (MHz)	Final Peak (dBµV/m)	Final Average (dBµV/m)	Final Peak (µV/m)	Final Average (µV/m)	Angle (°)	Height (m)	Polarisation
*							

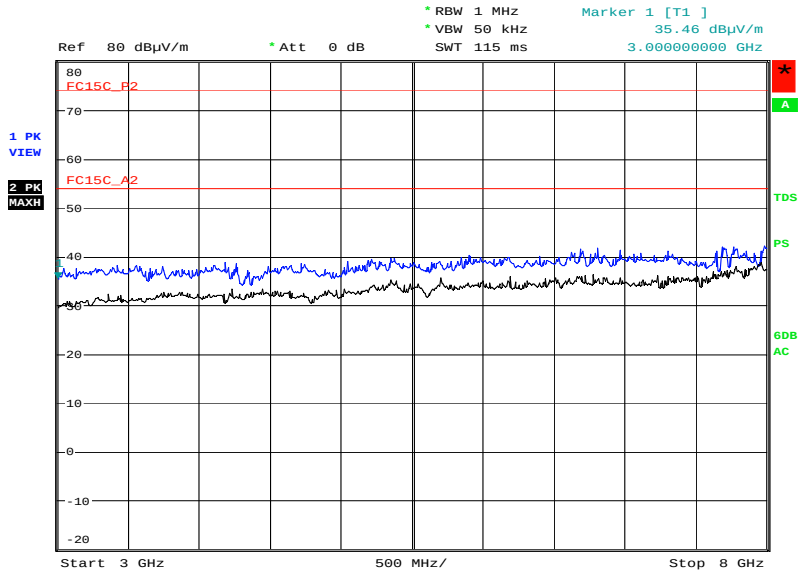
*No emissions were detected within 10 dB of the limit.

Bluetooth Low Energy, 2480 MHz, 1 GHz to 3 GHz, Spurious Radiated Emissions Plot



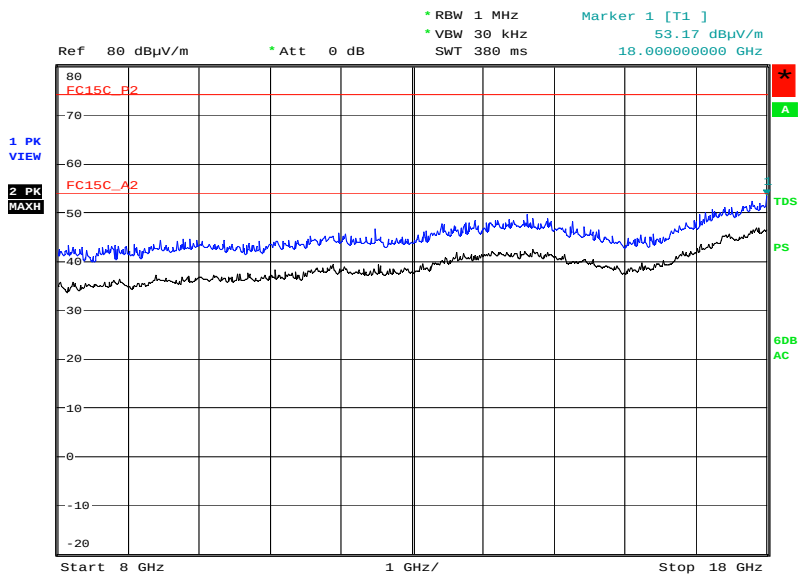
Product Service

Bluetooth Low Energy, 2480 MHz, 3 GHz to 8 GHz, Spurious Radiated Emissions Plot



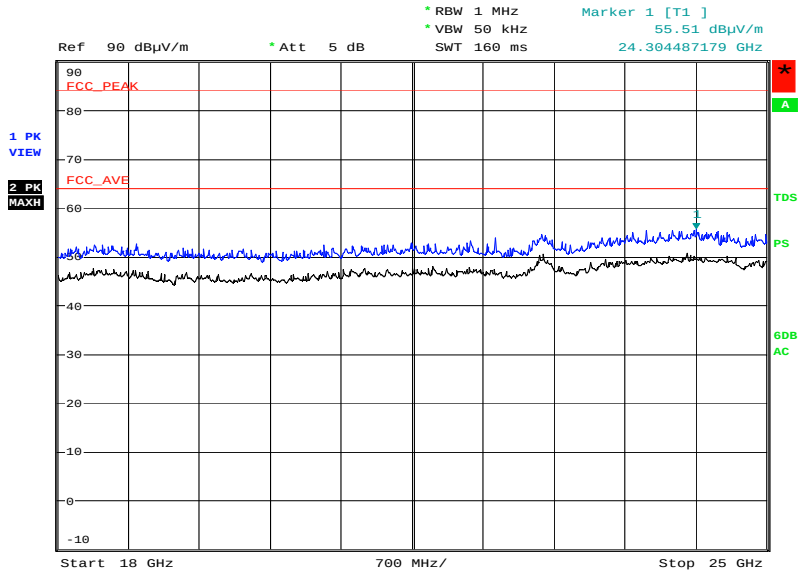
Date: 19.OCT.2015 21:18:23

Bluetooth Low Energy, 2480 MHz, 8 GHz to 18 GHz, Spurious Radiated Emissions Plot



Date: 19.OCT.2015 22:19:09

Bluetooth Low Energy, 2480 MHz, 18 GHz to 25 GHz, Spurious Radiated Emissions Plot



Date: 20.OCT.2015 22:45:49

FCC 47 CFR Part 15, Limit Clause 15.247 (d)

Emissions outside the restricted bands shall be at least 20 dB below the fundamental measured in a 100 kHz bandwidth using a peak detector. If the transmitter complies with the conducted power limits, based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB below the fundamental instead of 20 dB.

FCC 47 CFR Part 15, Limit Clause 15.205

	Peak (dBµV/m)	Average (dBµV/m)
Restricted Bands of Operation	74	54

FCC 47 CFR Part 15, Limit Clause 15.209

Frequency (MHz)	Field Strength			Measurement Distance (m)
	(µV/m)	Average (dBµV/m)	Peak (dBµV/m)	
30-88	100	40.0	60.0	3
88-216	150	43.5	63.5	3
216-960	200	46.0	66.0	3
Above 960	500	54.0	74.0	3

Product Service

Industry Canada RSS-247, Limit Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

2.5 RESTRICTED BAND EDGES

2.5.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.205
Industry Canada RSS-GEN, Clause 8.10

2.5.2 Equipment Under Test and Modification State

CPRmeter 2 S/N: C88396-0057 - Modification State 0

2.5.3 Date of Test

19 October 2015

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Test Procedure

The test was performed in accordance with ANSI C63.10, clauses 11.13, 6.6 and 6.10.5

2.5.6 Environmental Conditions

Ambient Temperature	20.3 - 20.6°C
Relative Humidity	37.0 - 43.0%

Product Service

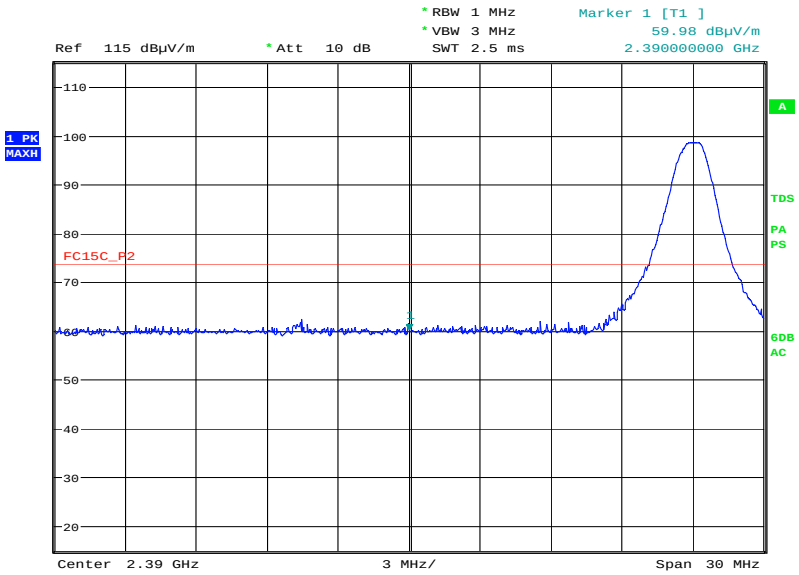
2.5.7 Test Results

5 V DC Supply

Bluetooth Low Energy, GFSK, Restricted Band Edges Results

2402 MHz		2480 MHz	
Measured Frequency 2390 MHz		Measured Frequency 2483.5 MHz	
dBµV/m		dBµV/m	
Final Peak	Final Average	Final Peak	Final Average
59.98	48.03	58.74	47.89

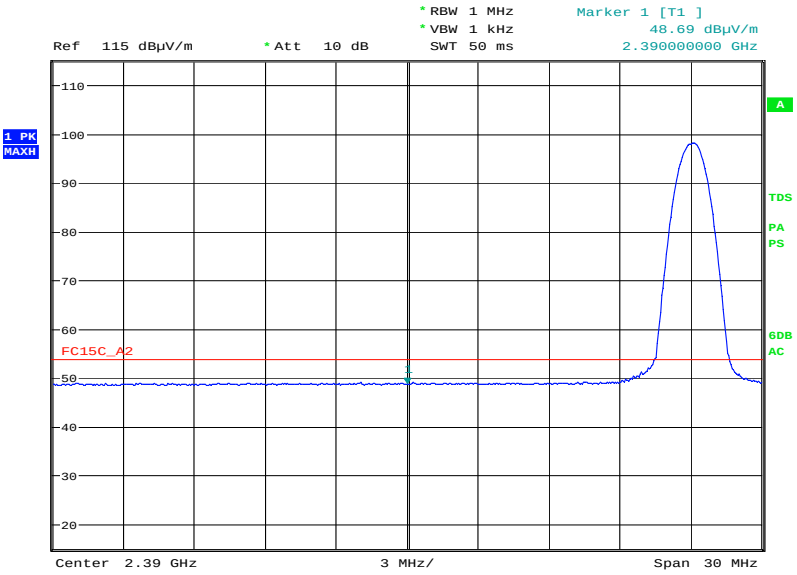
Bluetooth Low Energy, 2402 MHz, Measured Frequency 2390 MHz, GFSK, Final Peak, Restricted Band Edges Plot



Date: 19.OCT.2015 18:36:08

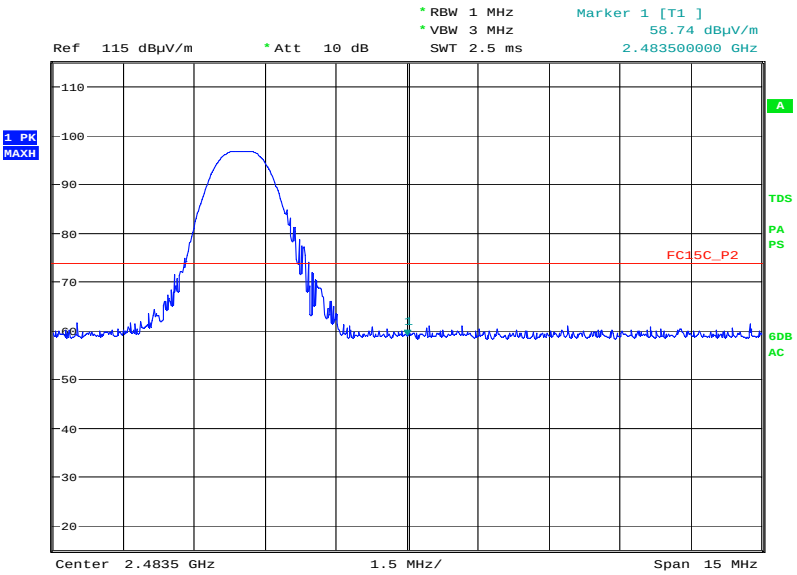
Product Service

Bluetooth Low Energy, 2402 MHz, Measured Frequency 2390 MHz, GFSK, Final Average, Restricted Band Edges Plot



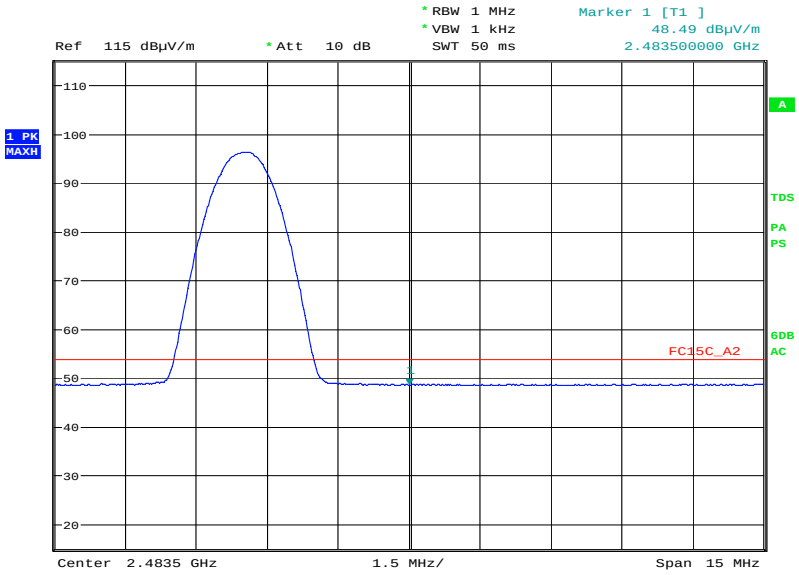
Date: 19.OCT.2015 18:57:15

Bluetooth Low Energy, 2480 MHz, Measured Frequency 2483.5 MHz, GFSK, Final Peak, Restricted Band Edges Plot



Date: 19.OCT.2015 21:04:24

Bluetooth Low Energy, 2480 MHz, Measured Frequency 2483.5 MHz, GFSK, Final Average, Restricted Band Edges Plot



Date: 19.OCT.2015 21:03:45

FCC 47 CFR Part 15, Limit Clause 15.205

	Peak (dBµV/m)	Average (dBµV/m)
Restricted Bands of Operation	74	54

Industry Canada RSS-GEN, Limit Clause 8.10

	Peak (dBµV/m)	Average (dBµV/m)
Restricted Bands of Operation	74	54

2.6 AUTHORISED BAND EDGES

2.6.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (d)
Industry Canada RSS-247, Clause 5.5

2.6.2 Equipment Under Test and Modification State

CPRmeter 2 S/N: C88396-0057 - Modification State 0

2.6.3 Date of Test

19 October 2015

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Test Procedure

The test was performed in accordance with ANSI C63.10, clauses 11.13, 6.6 and 6.10.4

2.6.6 Environmental Conditions

Ambient Temperature	20.3°C
Relative Humidity	43.0%

Product Service

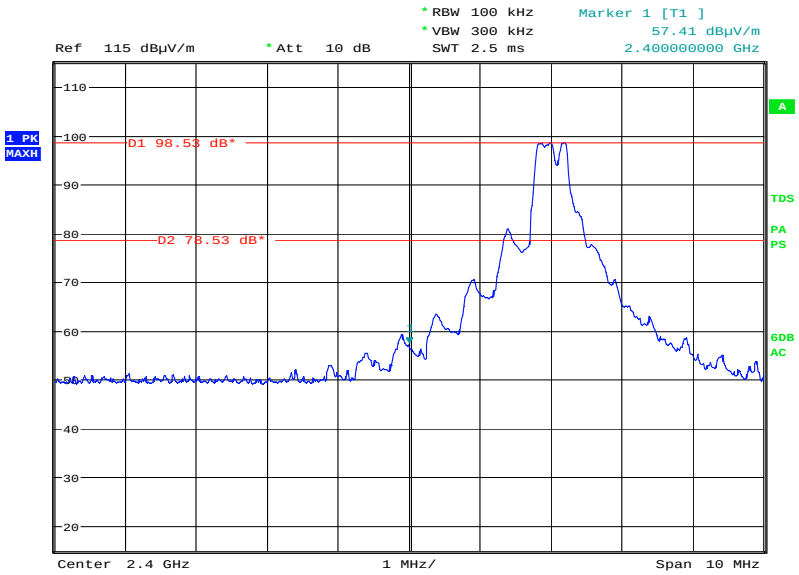
2.6.7 Test Results

5 V DC Supply

Bluetooth Low Energy, GFSK, Authorised Band Edges Results

2402 MHz	2480 MHz
Measured Frequency 2400.00 MHz	Measured Frequency 2483.50 MHz
dBµV/m	dBµV/m
Final Peak	Final Peak
57.41	49.04

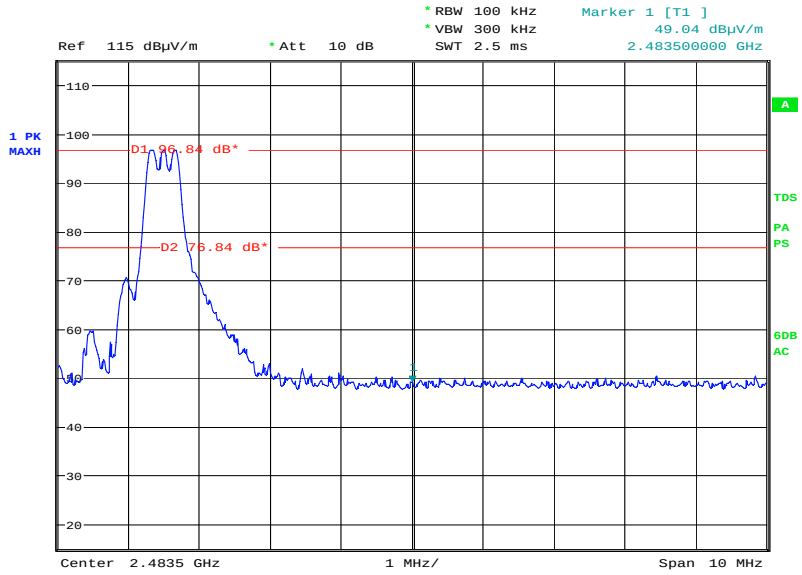
Bluetooth Low Energy, 2402 MHz, Measured Frequency 2400.00 MHz, GFSK, Final Peak, Authorised Band Edges Plot



Date: 19.OCT.2015 18:29:25

Product Service

Bluetooth Low Energy, 2480 MHz, Measured Frequency 2483.50 MHz, GFSK, Final Peak, Authorised Band Edges Plot



Date: 19.OCT.2015 21:00:42

FCC 47 CFR Part 15, Limit Clause 15.247 (d)

20 dB below the fundamental measured in a 100 kHz bandwidth using a peak detector. If the transmitter complies with the conducted power limits, based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB below the fundamental instead of 20 dB.

Industry Canada RSS-247, Limit Clause 5.5

20 dB below the fundamental measured in a 100 kHz bandwidth using a peak detector. If the transmitter complies with the conducted power limits, based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB below the fundamental instead of 20 dB.

Product Service

SECTION 3

TEST EQUIPMENT USED

Product Service

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1- Power Spectral Density					
Power Supply Unit	Farnell	LB30-4	158	-	O/P Mon
Attenuator (10dB)	Weinschel	47-10-34	481	12	1-Apr-2016
Digital Temperature Indicator	Fluke	51	1385	12	23-Sep-2016
Multimeter	Iso-tech	IDM101	2424	12	29-Sep-2016
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	20-Jan-2016
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	13-Feb-2016
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	16-Feb-2016
RadiPower Pulse Wireless Power Meter	DARE!! Instruments	RPR3006W	4438	0	15-Sep-2016
1 metre SMA Cable	IW Microwave	3PS-1806LC-394-3PS	4521	12	27-Jan-2016
Section 2.2 - 6 dB Bandwidth					
Power Supply Unit	Farnell	LB30-4	158	-	O/P Mon
Attenuator (10dB)	Weinschel	47-10-34	481	12	1-Apr-2016
Digital Temperature Indicator	Fluke	51	1385	12	23-Sep-2016
Multimeter	Iso-tech	IDM101	2424	12	29-Sep-2016
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	20-Jan-2016
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	13-Feb-2016
1 metre SMA Cable	IW Microwave	3PS-1806LC-394-3PS	4521	12	27-Jan-2016
Section 2.3 - Maximum Conducted Output Power					
Power Supply Unit	Farnell	LB30-4	158	-	O/P Mon
Attenuator (10dB)	Weinschel	47-10-34	481	12	1-Apr-2016
Digital Temperature Indicator	Fluke	51	1385	12	23-Sep-2016
Multimeter	Iso-tech	IDM101	2424	12	29-Sep-2016
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	20-Jan-2016
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	13-Feb-2016
1 metre SMA Cable	IW Microwave	3PS-1806LC-394-3PS	4521	12	27-Jan-2016

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.4 - Spurious Radiated Emissions					
Antenna (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	26-Nov-2015
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	29-Apr-2016
Antenna (Bilog)	Schaffner	CBL6143	287	24	3-Feb-2016
Pre-Amplifier	Phase One	PS04-0086	1533	12	30-Jul-2016
Pre-Amplifier	Phase One	PSO4-0087	1534	12	23-Dec-2015
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygromer	Rotronic	A1	2138	12	3-Dec-2015
Multimeter	Iso-tech	IDM101	2417	12	29-Sep-2016
Amplifier (1 - 8GHz)	Phase One	PS06-0060	3175	12	11-Aug-2016
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	27-Oct-2015
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Suspended Substrate Highpass Filter	Advance Power Components	11SH10-3000/X18000-O/O	4412	12	24-Mar-2016
2m K-Type Cable (Rx)	Scott Cables	KPS-1501-2000-KPS	4527	-	TU
0.5m SMA Cable (Rx)	Scott Cables	SLSLL18-SMSM-00.50M	4528	6	19-Feb-2016
Section 2.5 - Restricted Band Edges					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	29-Apr-2016
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygromer	Rotronic	A1	2138	12	3-Dec-2015
Multimeter	Iso-tech	IDM101	2417	12	29-Sep-2016
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	27-Oct-2015
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
2m K-Type Cable (Rx)	Scott Cables	KPS-1501-2000-KPS	4527	-	TU
Section 2.6 - Authorised Band Edges					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	29-Apr-2016
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygromer	Rotronic	A1	2138	12	3-Dec-2015
Multimeter	Iso-tech	IDM101	2417	12	29-Sep-2016
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	27-Oct-2015
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
2m K-Type Cable (Rx)	Scott Cables	KPS-1501-2000-KPS	4527	-	TU

TU – Traceability Unscheduled
O/P MON – Output Monitored with Calibrated Equipment

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	MU
6 dB Bandwidth	± 212.114 kHz
Maximum Conducted Output Power	± 0.70 dB
Power Spectral Density	± 3.0 dB
Authorised Band Edges	30 MHz to 1 GHz: ± 5.1 dB 1 GHz to 40 GHz: ± 6.3 dB
Restricted Band Edges	30 MHz to 1 GHz: ± 5.1 dB 1 GHz to 40 GHz: ± 6.3 dB
Spurious Radiated Emissions	30 MHz to 1 GHz: ± 5.1 dB 1 GHz to 40 GHz: ± 6.3 dB

Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).