Report on the FCC and IC Testing of the Wireless Measurement Ltd, Mercury Ethernet Gateway In accordance with FCC 47 CFR Part 15C, Industry Canada RSS-247 and Industry Canada RSS-GEN

Product Service

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FCC ID: 2AKX6-E01 IC: 22384-E01

COMMERCIAL-IN-CONFIDENCE

Date: January 2018
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RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Steven White	29 January 2018	
Authorised Signatory	Matthew Russell	29 January 2018	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

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.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Nandhini Mathivanan	29 January 2018	
Testing	Graeme Lawler	29 January 2018	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

Industry Canada Accreditation
IC2932B-1 Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY
A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15C: 2016, Industry Canada RSS-247: Issue 2 (2017-02) and Industry Canada RSS-GEN: Issue 4 (2014-11) for the tests detailed in section 1.3.

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Contents

1 Report Summary 2

1.1 Report Modification Record 2
1.2 Introduction 2
1.3 Brief Summary of Results 3
1.4 Application Form 4
1.5 Product Information 6
1.6 Deviations from the Standard 6
1.7 EUT Modification Record 6
1.8 Test Location 6

2 Test Details 7

2.1 Maximum Conducted Output Power 7
2.2 Power Spectral Density 9
2.3 Emission Bandwidth 12
2.4 Authorised Band Edges 15
2.5 Restricted Band Edges 18
2.6 Spurious Radiated Emissions 23

3 Measurement Uncertainty 35

1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	29 January 2018

Table 1

1.2 Introduction

Applicant	Wireless Measurement Ltd
Manufacturer	Wireless Measurement Ltd
Model Number(s)	Mercury Ethernet Gateway (WSG-ETHI-G4-SMA)
Serial Number(s)	39145
Hardware Version(s)	1.0
Software Version(s)	Not defined
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15C: 2016 Industry Canada RSS-247: Issue 2 (2017-02) Industry Canada RSS-GEN: Issue 4 (2014-11)
Order Number	171205
Date	14-December-2017
Date of Receipt of EUT	19-December-2017
Start of Test	01-January-2018
Finish of Test	11-January-2018
Name of Engineer(s)	Nandhini Mathivanan and Graeme Lawler
Related Document(s)	ANSI C63.10 (2013)

1.3 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			
Configuration and Mode: IEEE 802.15.4 Transmit						
2.1	15.247 (b)(3)	5.4	6.12	Maximum Conducted Output Power	Pass	ANSI C63.10
2.2	15.247 (e)	5.2	6.12	Power Spectral Density	Pass	ANSI C63.10
2.3	15.247 (a)(2)	5.2	6.6	Emission Bandwidth	Pass	ANSI C63.10
2.4	15.247 (d)	5.5	-	Authorised Band Edges	Pass	ANSI C63.10
2.5	15.205	-	8.10	Restricted Band Edges	Pass	ANSI C63.10
2.6	15.247 (d) and 15.205	5.5	6.13	Spurious Radiated Emissions	Pass	ANSI C63.10

Table 2

1.4 Application Form

EQUIPMENT DESCRIPTION	
Model Name/Number	MERCURY ETHERNET GATEWAY
Part Number	WSG-ETHI-G4-SMA
Hardware Version	1.0
Software Version	
FCC ID (if applicable)	2AKX6
Industry Canada ID (if applicable)	22384
Technical Description (Please provide a brief description of the intended use of the equipment)	2.4GHz to Ethernet transceiver

INTENTIONAL RADIATORS									
Technology	Frequency Band (MHz)	Conducted Declared Output Power (dBm)	Antenna Gain (dBi)	Supported Bandwidth (s) (MHz)	Modulation Scheme(s)	ITU Emission Designator	Test Channels (MHz)		
							Bottom	Middle	Top
802.15.4	2400	<8dBm	4.9	2	O-QPSK	2M00 GIDBN	2405	2440	2475

UN-INTENTIONAL RADIATOR	
Highest frequency generated or used in the device or on which the device operates or tunes	2475

Power Source			
AC	Single Phase	Three Phase	Nominal Voltage
External DC	Nominal Voltage	Maximum Current	
	5	<250mA	
Battery	Nominal Voltage	Battery Operating End Point Voltage	
Can EUT transmit whilst being charged?	Yes ☐ No ☐		

EXTREME CONDITIONS					
Maximum temperature	60	°C	Minimum temperature	-30	°C

Ancillaries
Please list all ancillaries which will be used with the device.
PULSE W1038 ANTENNA

ANTENNA CHARACTERISTICS						
☒	Antenna connector			State impedance	50	Ohm
☐	Temporary antenna connector			State impedance		Ohm
☐	Integral antenna	Type				
☒	External antenna	Type	PULSE W1038 1/4W			

I hereby declare that the information supplied is correct and complete.

Name: MIKE MILLEN
Position held: ENGINEER Date: 14 DEC 2017

1.5 Product Information

1.5.1 Technical Description

The device is an Ethernet Gateway, which facilitates the connection of wireless measurement sensors operating at 2.4GHz to internet.

1.5.2 Power Source

Unless otherwise stated, all tests were performed using an external 5 V DC battery power source which was provided by the manufacturer and is typical of 'normal operation'.

1.6 Deviations from the Standard

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

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test programme.
The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Serial Number: 39145			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3

1.8 Test Location

TÜV SÜD Product Service conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: IEEE 802.15.4 Transmit		
Maximum Conducted Output Power	Nandhini Mathivanan	UKAS
Power Spectral Density	Nandhini Mathivanan	UKAS
Emission Bandwidth	Nandhini Mathivanan	UKAS
Authorised Band Edges	Graeme Lawler	UKAS
Restricted Band Edges	Graeme Lawler	UKAS
Spurious Radiated Emissions	Graeme Lawler	UKAS

Table 4

Office Address:

Octagon House
Concorde Way
Segensworth North
Fareham, Hampshire
PO15 5RL, United Kingdom

2 Test Details

2.1 Maximum Conducted Output Power

2.1.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (b)(3)
Industry Canada RSS-247, Clause 5.4
Industry Canada RSS-GEN, Clause 6.12

2.1.2 Equipment Under Test and Modification State

WSG-ETHI-G4-SMA, S/N: 39145 - Modification State 0

2.1.3 Date of Test

10-January-2018

2.1.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 11.9.2.2.2.

2.1.5 Environmental Conditions

Ambient Temperature	22.6 °C
Relative Humidity	35.5 %

2.1.6 Test Results

IEEE 802.15.4 - Transmit

Frequency (MHz)	Output Power	
	dBm	mW
2405.0	4.67	2.93
2440.0	4.22	2.64
2475.0	4.23	2.65

Table 5

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

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 (d)

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 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e) of the specification.

2.1.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
10dB/1W SMA Attenuator dc -18GHz	Sealectro	60-674-1010-89	3	12	30-Jun-2018
Hygrometer	Rotronic	I-1000	3220	12	30-Aug-2018
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	02-Oct-2018
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	19-Sep-2018
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4518	12	19-Sep-2018
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	06-Oct-2018

Table 6

2.2 Power Spectral Density

2.2.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (e)
Industry Canada RSS-247, Clause 5.2
Industry Canada RSS-GEN, Clause 6.12

2.2.2 Equipment Under Test and Modification State

WSG-ETHI-G4-SMA, S/N: 39145 - Modification State 0

2.2.3 Date of Test

10-January-2018 to 11-January-2018

2.2.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.10.3.

2.2.5 Environmental Conditions

Ambient Temperature	22.5 - 22.6 °C
Relative Humidity	32.1 - 35.4 %

2.2.6 Test Results

IEEE 802.15.4 - Transmit

Frequency (MHz)	Power Spectral Density (dBm)
2405.0	-8.363
2440.0	-8.629
2475.0	-8.379

Table 7

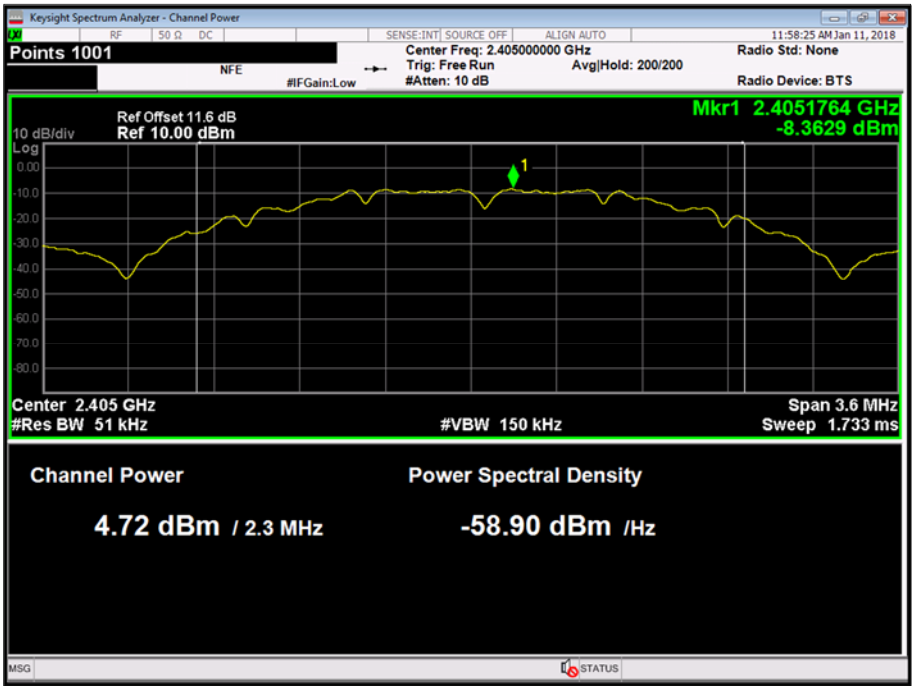

Figure 1 - 2405.0 MHz

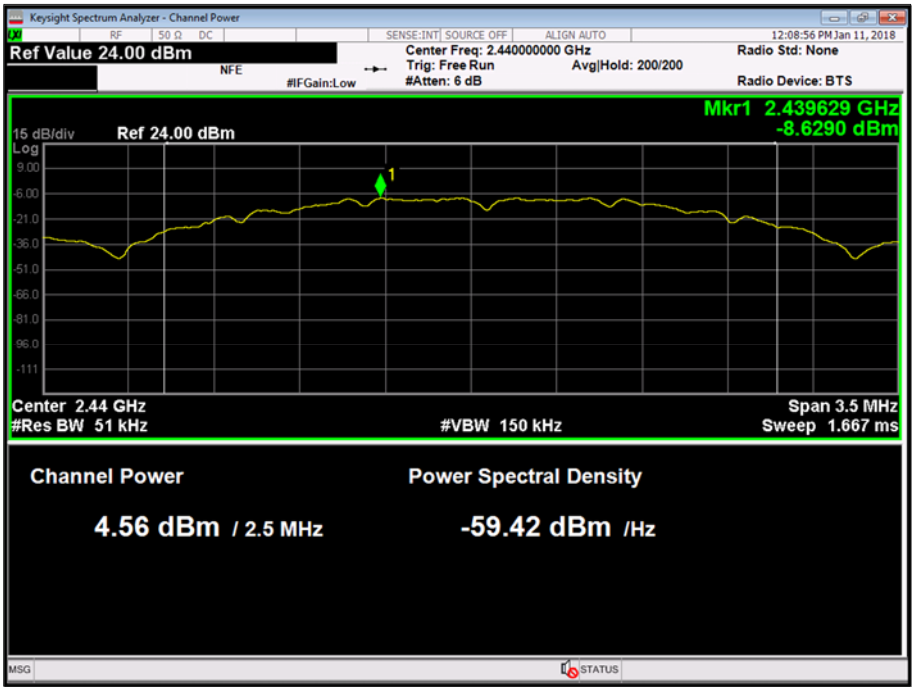

Figure 2 - 2440.0 MHz

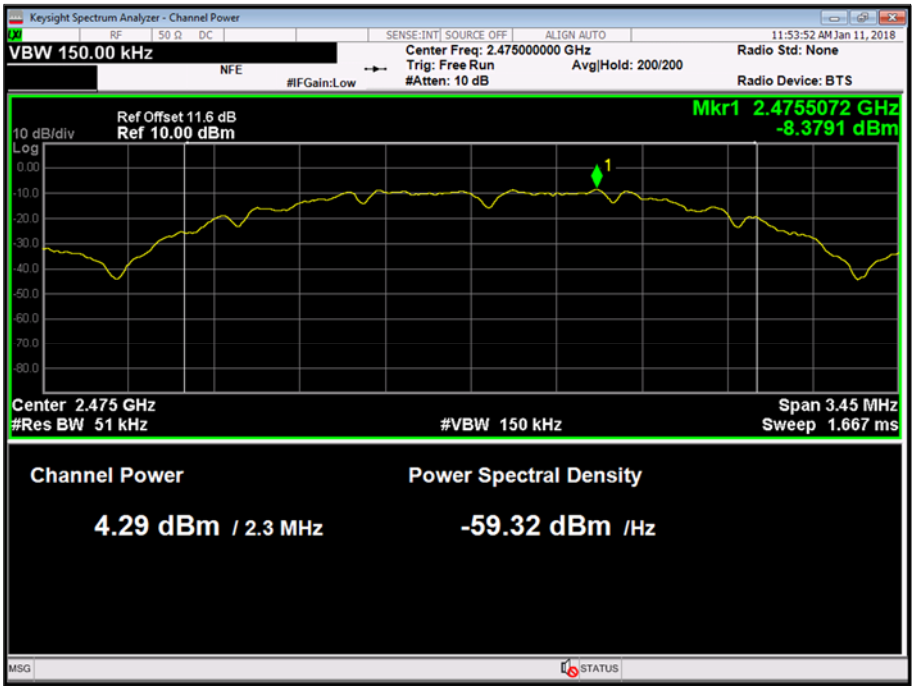

Figure 3 - 2475.0 MHz

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(b)

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.

2.2.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
10dB/1W SMA Attenuator dc -18GHz	Sealectro	60-674-1010-89	3	12	30-Jun-2018
Hygrometer	Rotronic	I-1000	3220	12	30-Aug-2018
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	02-Oct-2018
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	19-Sep-2018
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4518	12	19-Sep-2018
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	06-Oct-2018

Table 8

2.3 Emission Bandwidth

2.3.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (a)(2)
Industry Canada RSS-247, Clause 5.2
Industry Canada RSS-GEN, Clause 6.6

2.3.2 Equipment Under Test and Modification State

WSG-ETHI-G4-SMA, S/N: 39145 - Modification State 0

2.3.3 Date of Test

10-January-2018

2.3.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 11.8.2.

2.3.5 Environmental Conditions

Ambient Temperature	22.7 °C
Relative Humidity	35.2 %

2.3.6 Test Results

IEEE 802.15.4 - Transmit

Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
2405	1.598	2.409
2440	1.582	2.372
2475	1.582	2.387

Table 9

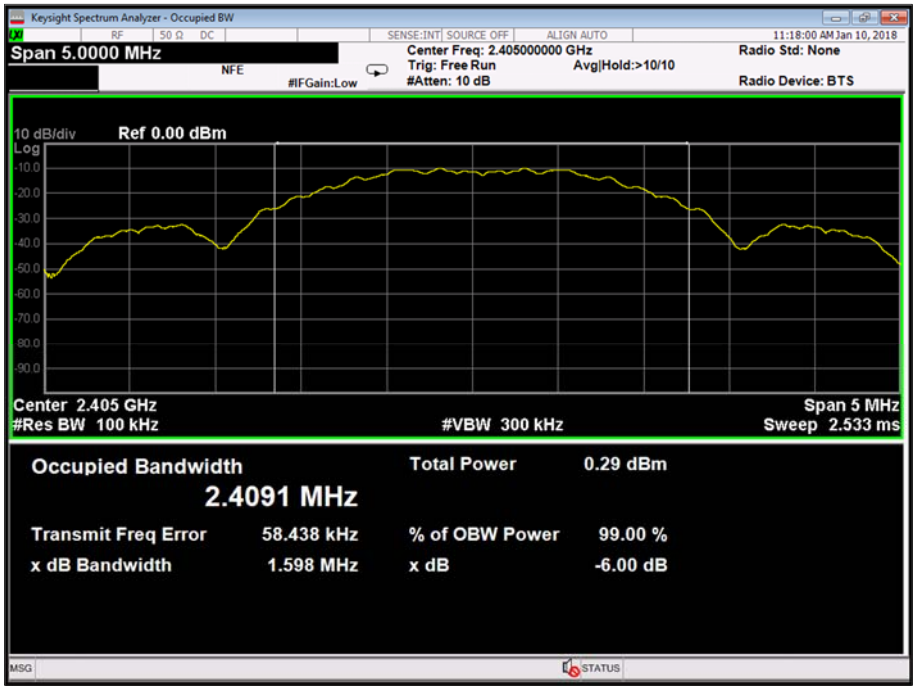

Figure 4 - 2405 MHz – 6 dB Bandwidth and 99% Occupied Bandwidth

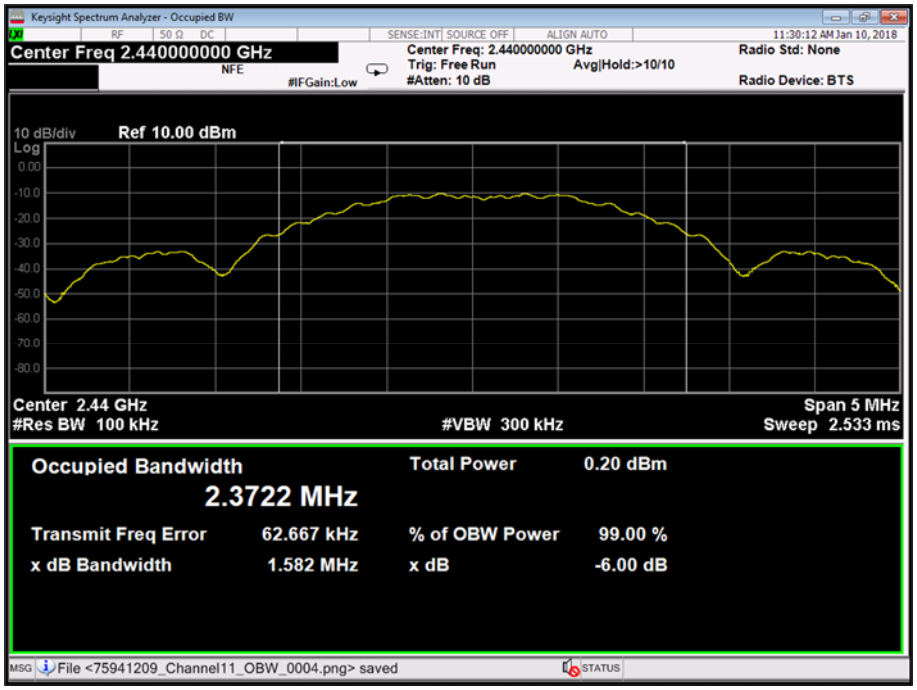

Figure 5 - 2440 MHz – 6 dB Bandwidth and 99% Occupied Bandwidth

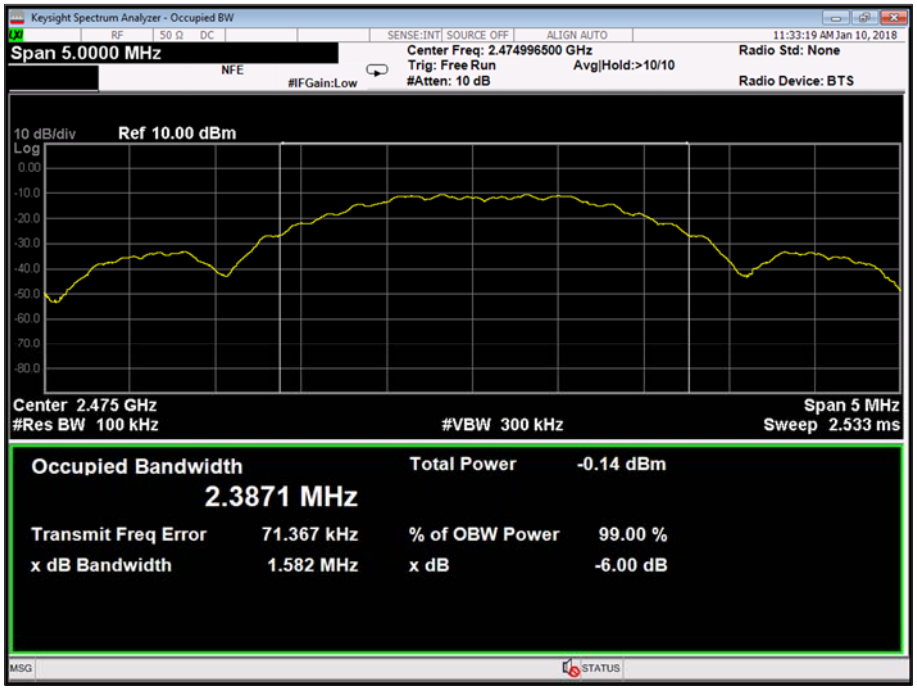

Figure 6 - 2475 MHz – 6 dB Bandwidth and 99% Occupied Bandwidth

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

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

2.3.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
10dB/1W SMA Attenuator dc -18GHz	Sealectro	60-674-1010-89	3	12	30-Jun-2018
Hygrometer	Rotronic	I-1000	3220	12	30-Aug-2018
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4518	12	19-Sep-2018
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	06-Oct-2018

Table 10

2.4 Authorised Band Edges

2.4.1 Specification Reference

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

2.4.2 Equipment Under Test and Modification State

WSG-ETHI-G4-SMA, S/N: 39145 - Modification State 0

2.4.3 Date of Test

01-January-2018

2.4.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 6.10.4.
The following conversion can be applied to convert from dBµV/m to µV/m:
10^(Field Strength in dBµV/m/20).

2.4.5 Environmental Conditions

Ambient Temperature 12.7 °C
Relative Humidity 46.0 %

2.4.6 Test Results

IEEE 802.15.4 - Transmit

Mode	Frequency (MHz)	Measured Frequency (MHz)	Level (dBc)
Static	2405.0	2400.0	-41.41
Static	2475.0	2483.5	-49.52

Table 11

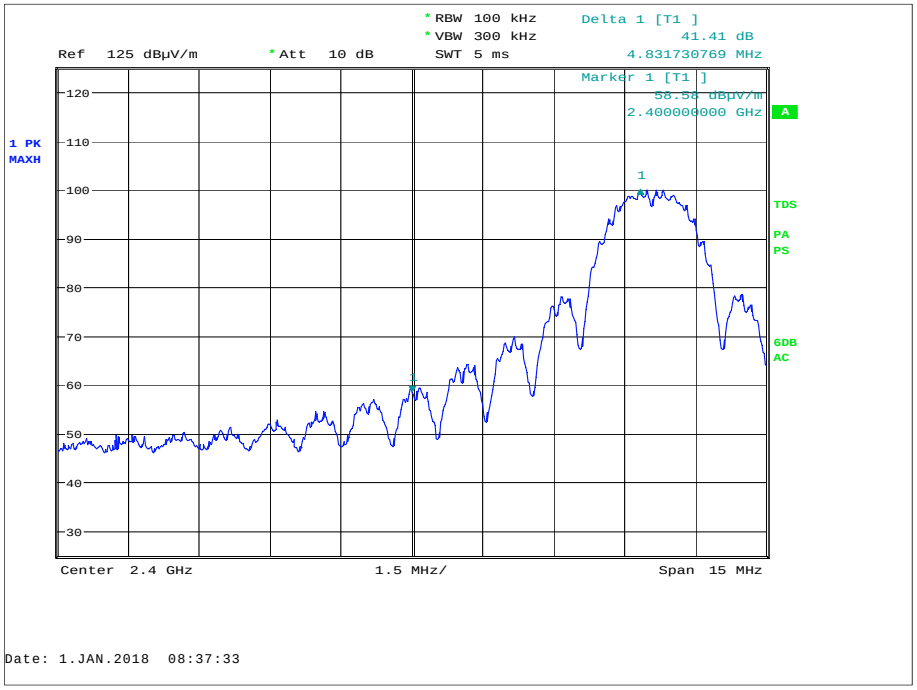

Figure 7 - Static 2405 MHz - Measured Frequency 2400 MHz

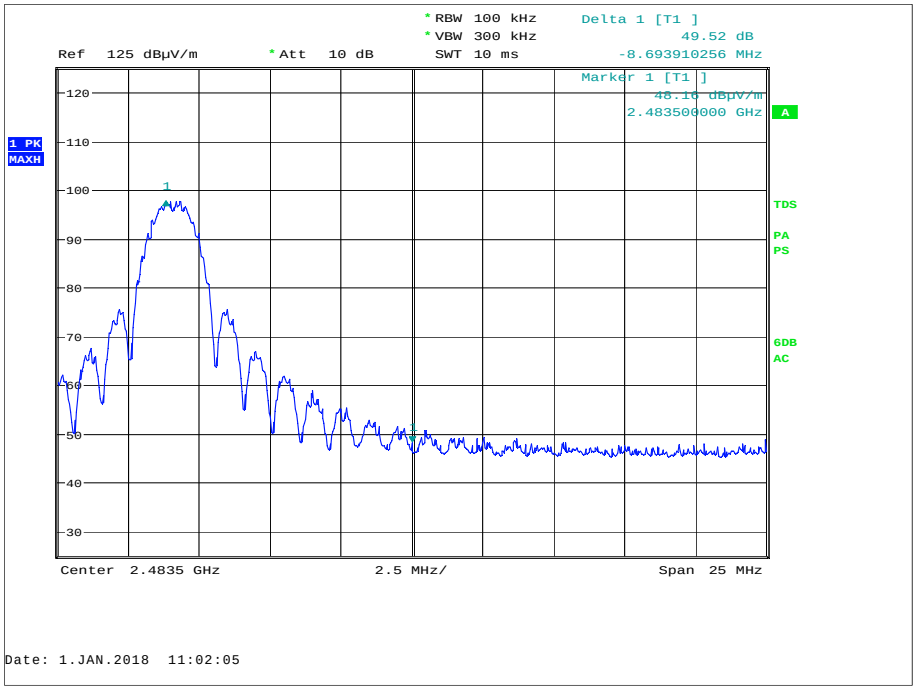

Figure 8 – 2475 Static MHz - Measured Frequency 2483.5 MHz

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

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.

2.4.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Screened Room (5)	Rainford	Rainford	1545	36	20-Jan-2018
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Cable (N-N, 8m)	Rhophase	NPS-2302-8000-NPS	3248	12	02-May-2018
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Nov-2018
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Hygropalm Temperature and Humidity Meter	Rotronic	HP21	4410	12	04-May-2018
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	22-May-2018
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	17-Feb-2018

Table 12

TU - Traceability Unscheduled

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

WSG-ETHI-G4-SMA, S/N: 39145 - Modification State 0

2.5.3 Date of Test

01-January-2018

2.5.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 6.10.5.

Plots for average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.3. These are shown for information purposes and were used to determine the worst case measurement point. Final average measurements were then taken in accordance with ANSI C63.10 clause 4.1.4.2.2. to obtain the measurement result recorded in the test results tables.

The following conversion can be applied to convert from dBµV/m to µV/m:
10^(Field Strength in dBµV/m/20).

2.5.5 Environmental Conditions

Ambient Temperature 12.7 °C
Relative Humidity 46.0 %

2.5.6 Test Results

IEEE 802.15.4 - Transmit

Mode	Frequency (MHz)	Measured Frequency (MHz)	Peak Level (dBµV/m)	Average Level (dBµV/m)
Static	2405.0	2390.0	58.31	46.37
Static	2475.0	2483.5	59.50	48.04

Table 13

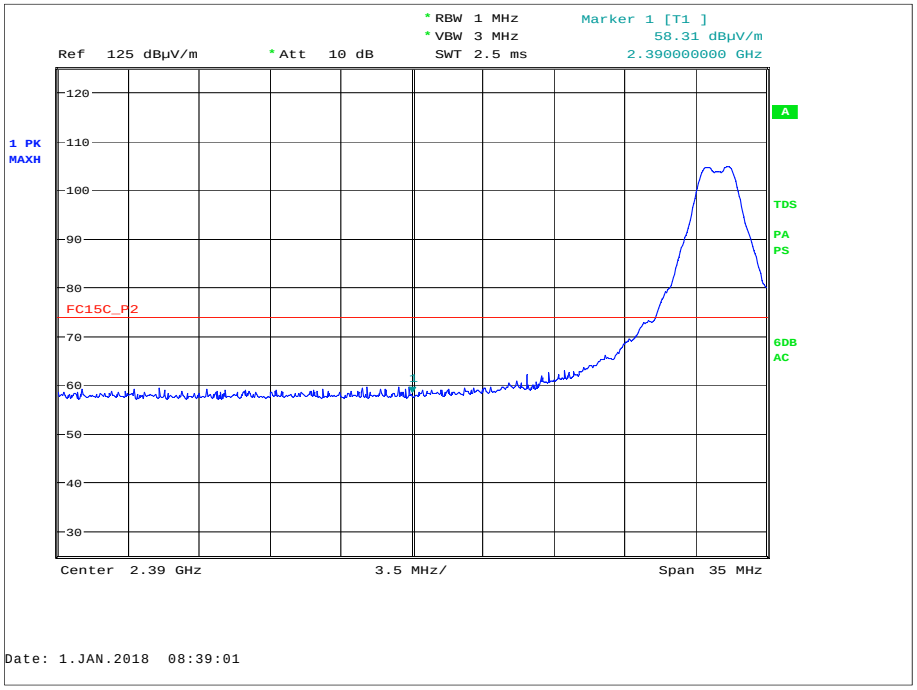

Figure 9 - Static 2405 MHz - Measured Frequency 2390 MHz - Peak

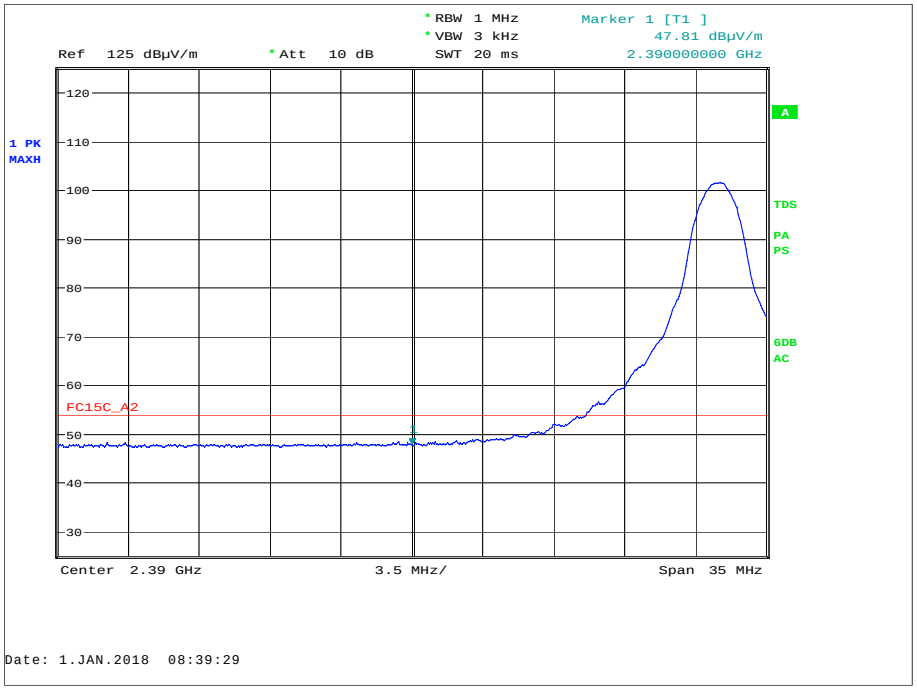

Figure 10 - Static 2405 MHz - Measured Frequency 2390 MHz - Average

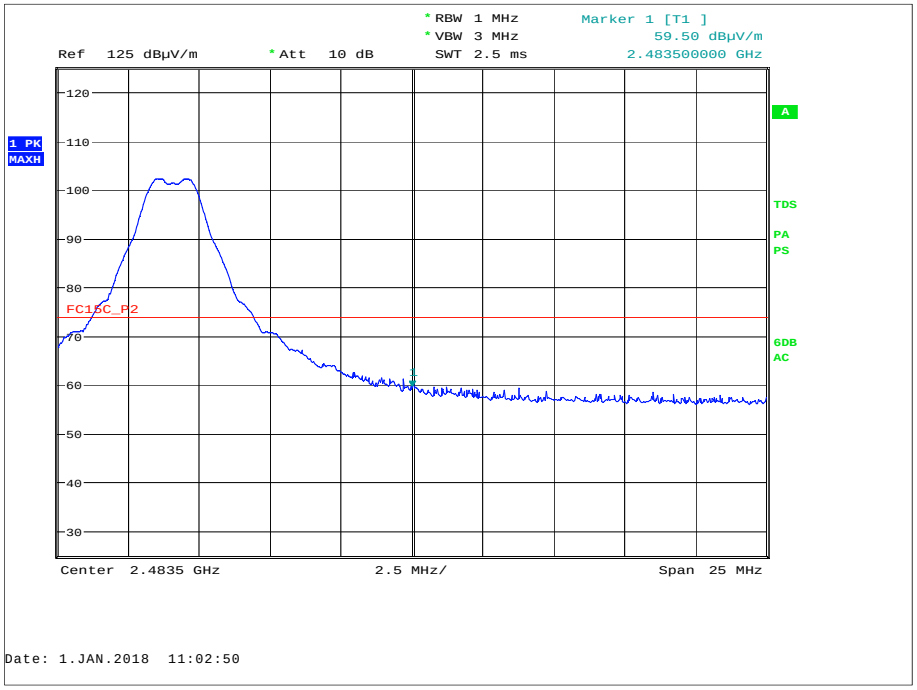

Figure 11 - Static 2475 MHz - Measured Frequency 2483.5 MHz - Peak

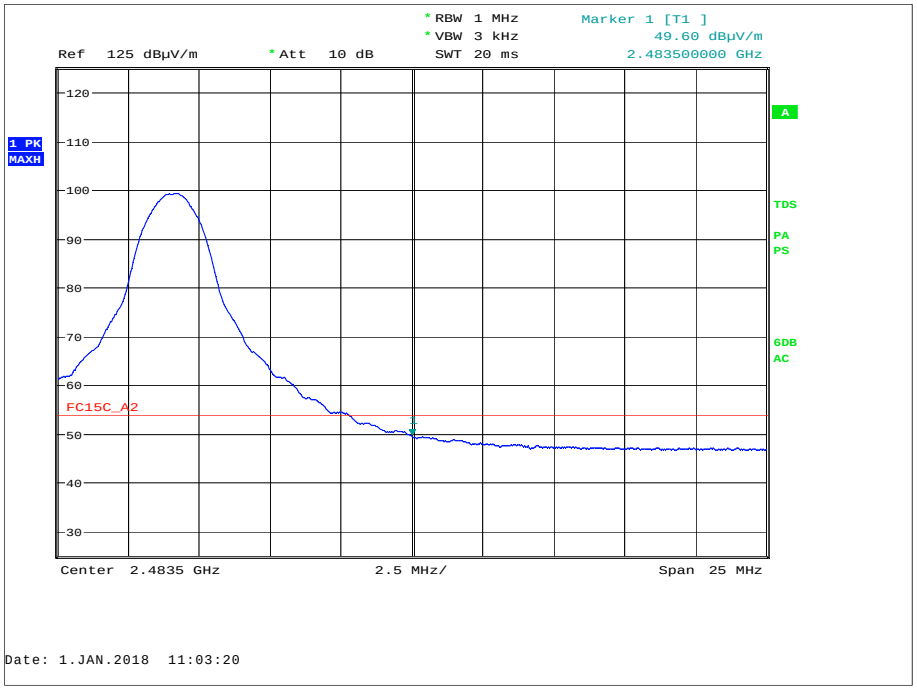

Figure 12 - Static 2475 MHz - Measured Frequency 2483.5 MHz - Average

FCC 47 CFR Part 15, Limit Clause 15.209

Frequency (MHz)	Field Strength (µV/m at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

Table 14

Industry Canada RSS-GEN, Limit Clause 8.9

Frequency (MHz)	Field Strength (µV/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960*	500

Table 15

*Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

2.5.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Screened Room (5)	Rainford	Rainford	1545	36	20-Jan-2018
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Cable (N-N, 8m)	Rhophase	NPS-2302-8000-NPS	3248	12	02-May-2018
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Nov-2018
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Hygropalm Temperature and Humidity Meter	Rotronic	HP21	4410	12	04-May-2018
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	22-May-2018
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	17-Feb-2018

Table 16

TU - Traceability Unscheduled

2.6 Spurious Radiated Emissions

2.6.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (d) and 15.205
Industry Canada RSS-247, Clause 5.5
Industry Canada RSS-GEN, Clause 6.13

2.6.2 Equipment Under Test and Modification State

WSG-ETHI-G4-SMA, S/N: 39145 - Modification State 0

2.6.3 Date of Test

01-January-2018

2.6.4 Test Method

This test was performed in accordance with ANSI C63.10-2013 clause 6.3, 6.5 and 6.6.

For frequencies > 1 GHz, plots for average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.3 to characterize the EUT. Where emissions were detected, final average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.2.

The plots shown are the characterization of the EUT. The limits on the plots represent the most stringent case for restricted bands, (74/54 dBuV/m) when compared to 20 dBc outside restricted bands. The limits shown have been used as a threshold to determine where further measurements are necessary. Where results are within 10 dB of the limits shown on the plots, further investigation was carried out and reported in results tables.

The following conversion can be applied to convert from dBµV/m to µV/m:
10^(Field Strength in dBµV/m/20).

For frequencies > 18 GHz, the measurement distance was reduced to 1 meter and the limit line was increased by 20*LOG(3/1) = 9.54 dB.

2.6.5 Environmental Conditions

Ambient Temperature	12.7 °C
Relative Humidity	46.0 %

2.6.6 Test Results

IEEE 802.15.4 Transmit

Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dBuV/m)	Angle(Deg)	Height(m)	Polarity
31.924	29.5	40.0	-10.5	30	1.00	Vertical
60.008	31.1	40.0	-8.9	70	1.00	Vertical
155.501	34.1	43.5	-9.4	360	1.00	Vertical
171.097	38.4	43.5	-5.1	62	1.57	Horizontal
172.468	34.3	43.5	-9.2	153	1.00	Vertical
960.000	33.8	46.0	-12.2	93	1.58	Horizontal

Table 17 – 2405 MHz - 30 MHz to 1 GHz Emissions Results

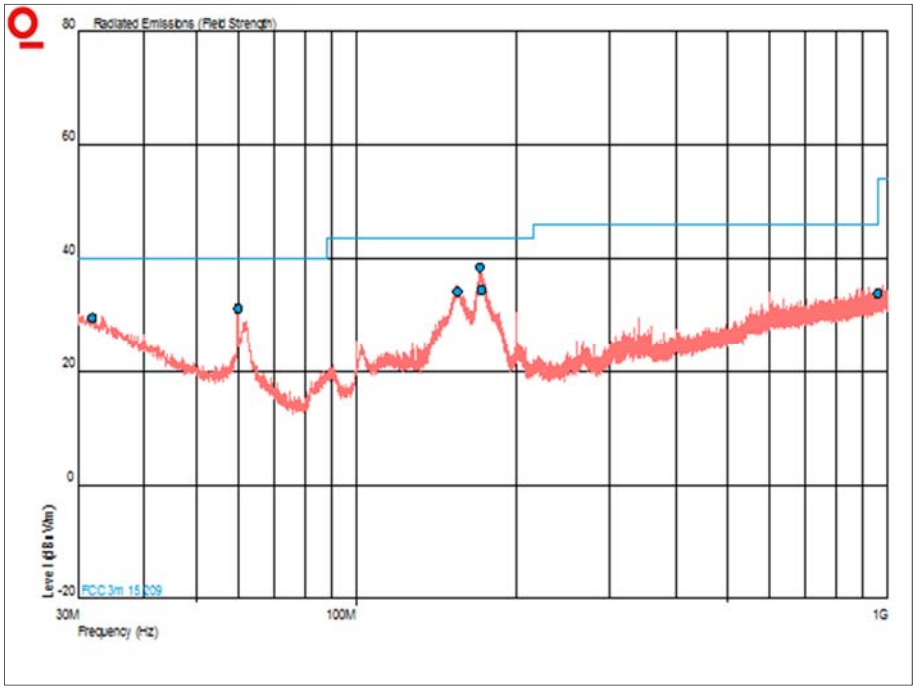

Figure 13 - 2405 MHz - 30 MHz to 1 GHz - Horizontal and Vertical

Frequency (GHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)	
	Peak	Average	Peak	Average	Peak	Average
4.809029	61.64	53.82	73.98	53.98	-12.34	-0.16

Table 18 - 2405 MHz - 1 GHz to 25 GHz Emissions Results

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

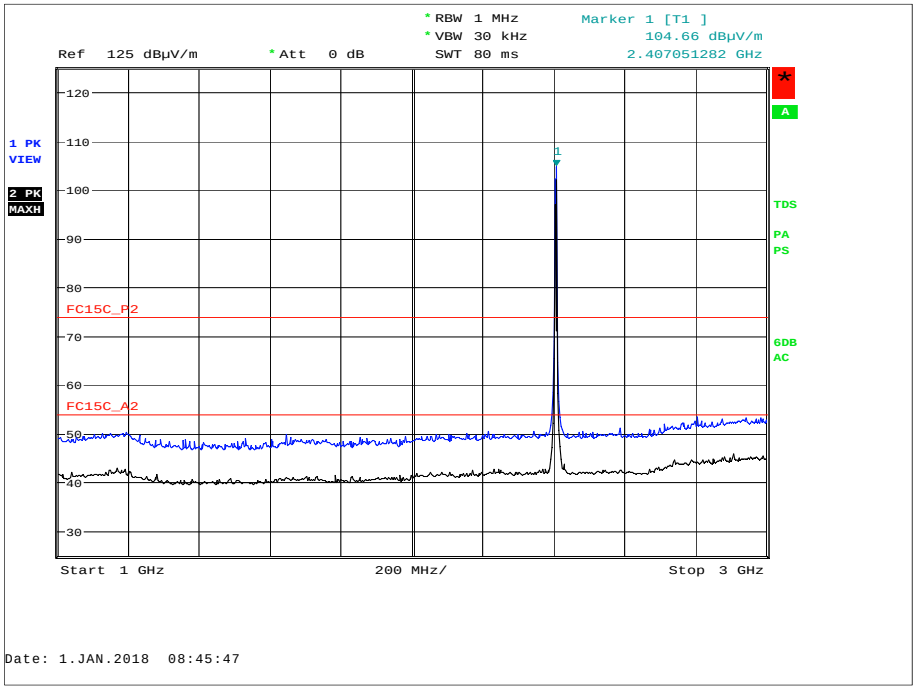

Figure 14 – 2405 MHz - 1 GHz to 3 GHz - Horizontal and Vertical

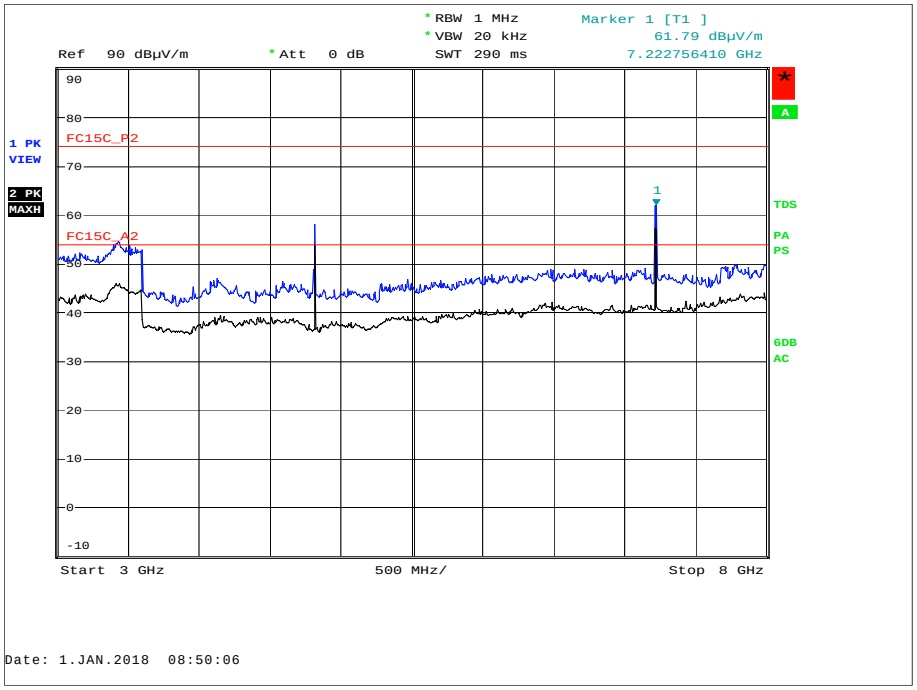

Figure 15 - 2405 MHz - 3 GHz to 8 GHz - Horizontal and Vertical

NOTE: Marker frequency falls outside of restricted band therefore the limit is -20 dBc for peak measurements and -30 dBc for average measurements. The above plot shows more than 10 dB margin when assessed against these limits therefore no further measurements were made.

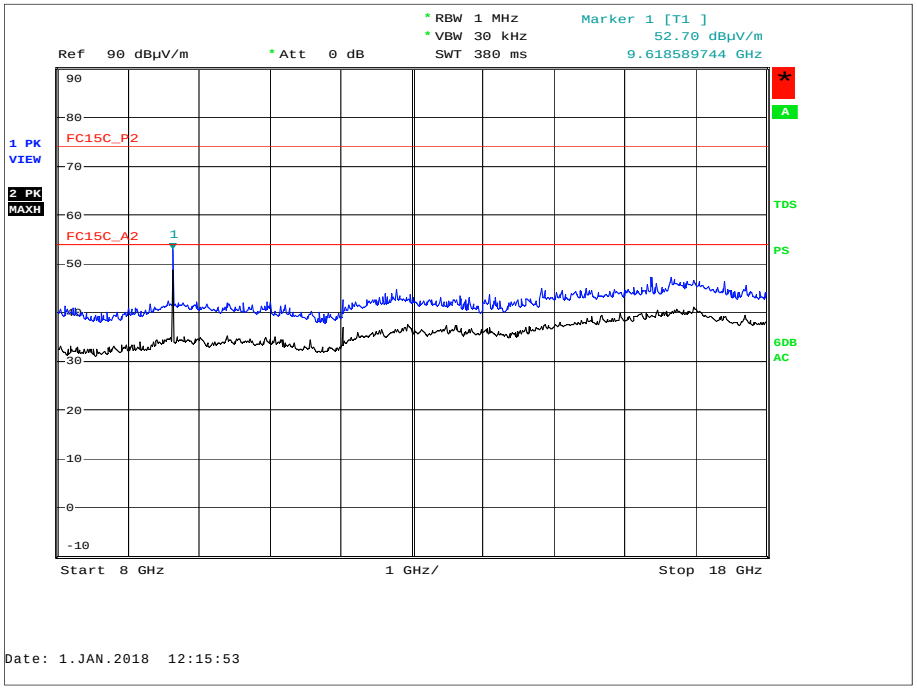

Figure 16 – 2405 MHz - 8 GHz to 18 GHz - Horizontal and Vertical

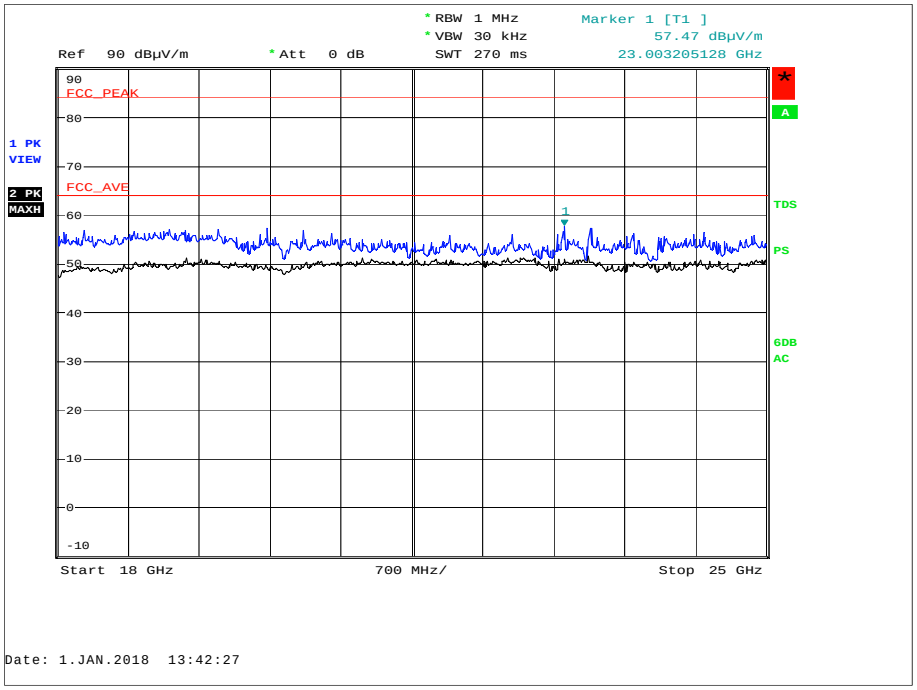

Figure 17 – 2405 MHz - 18 GHz to 25 GHz - Horizontal and Vertical

Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dBuV/m)	Angle(Deg)	Height(m)	Polarity
31.144	29.9	40.0	-10.1	360	1.00	Vertical
39.997	30.7	40.0	-9.3	347	2.56	Vertical
160.033	34.2	43.5	-9.3	74	1.00	Vertical
171.744	39.0	43.5	-4.5	88	1.09	Horizontal
172.345	36.4	43.5	-7.1	169	1.00	Vertical
960.000	33.8	46.0	-12.2	7	3.80	Vertical

Table 19 - 2440 MHz - 30 MHz to 1 GHz Emissions Results

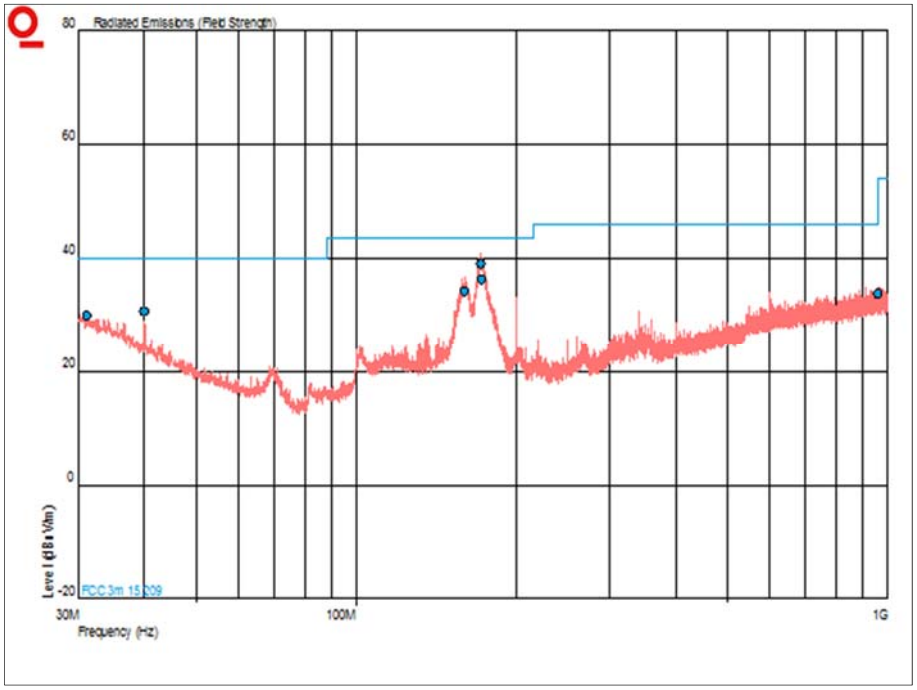

Figure 18 - 2440 MHz - 30 MHz to 1 GHz - Horizontal and Vertical

Frequency (GHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)	
	Peak	Average	Peak	Average	Peak	Average
4.879167	62.00	53.95	73.98	53.98	-11.98	-0.03
7.321652	62.14	53.95	73.98	53.98	-11.84	-0.03

Table 20 - 2440 MHz - 1 GHz to 25 GHz Emissions Results

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

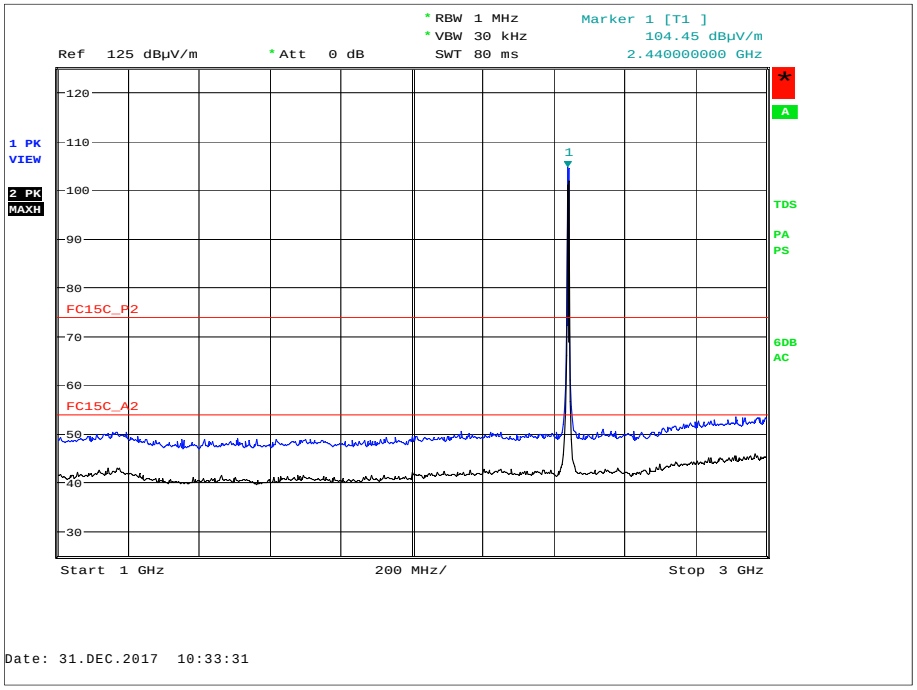

Figure 19 - 2440 MHz - 1 GHz to 3 GHz - Horizontal and Vertical

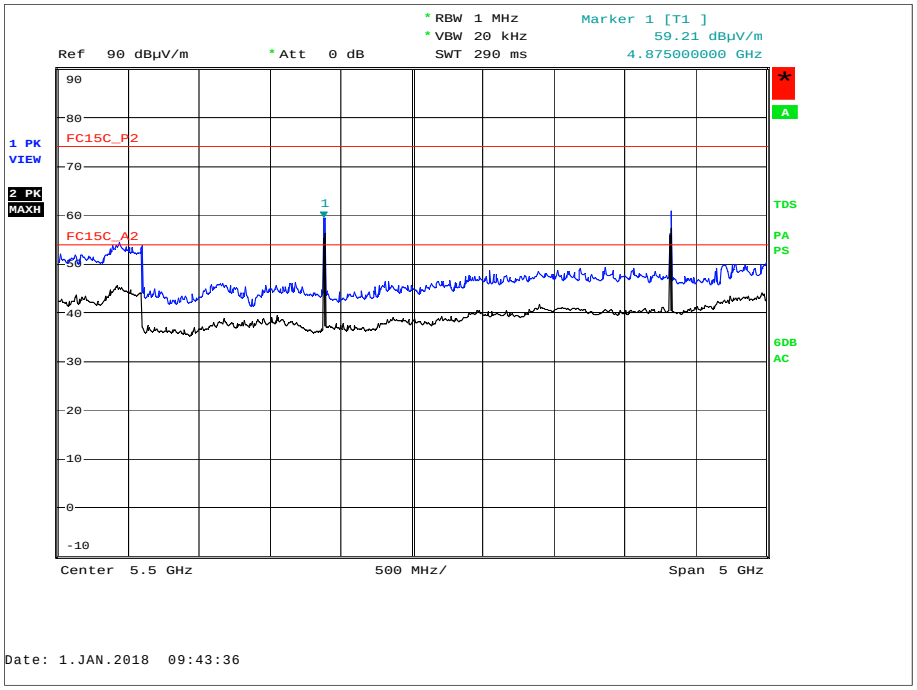

Figure 20 - 2440 MHz - 3 GHz to 8 GHz - Horizontal and Vertical

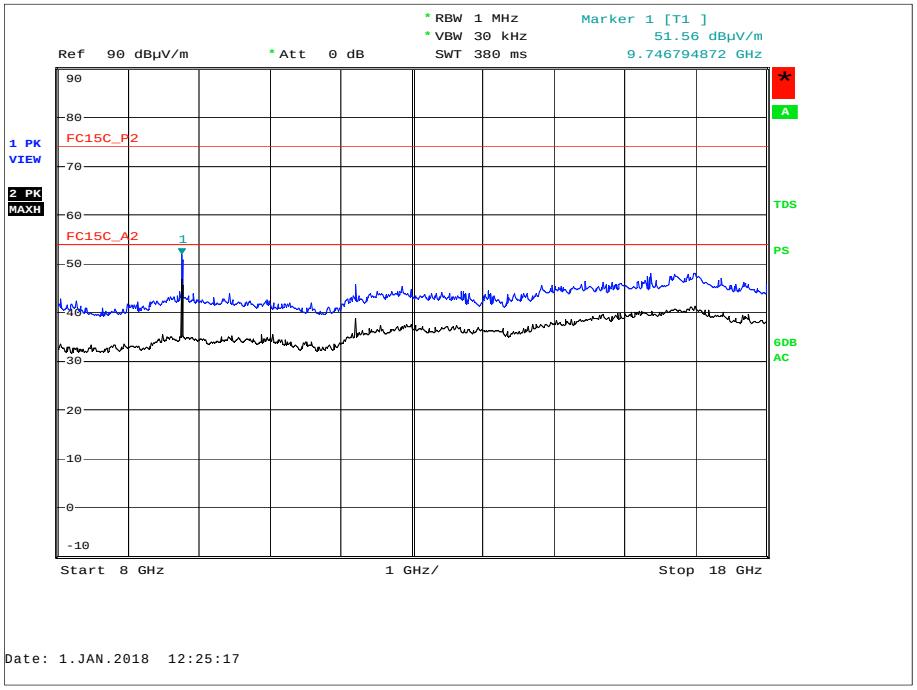

Figure 21 - 2440 MHz - 8 GHz to 18 GHz - Horizontal and Vertical

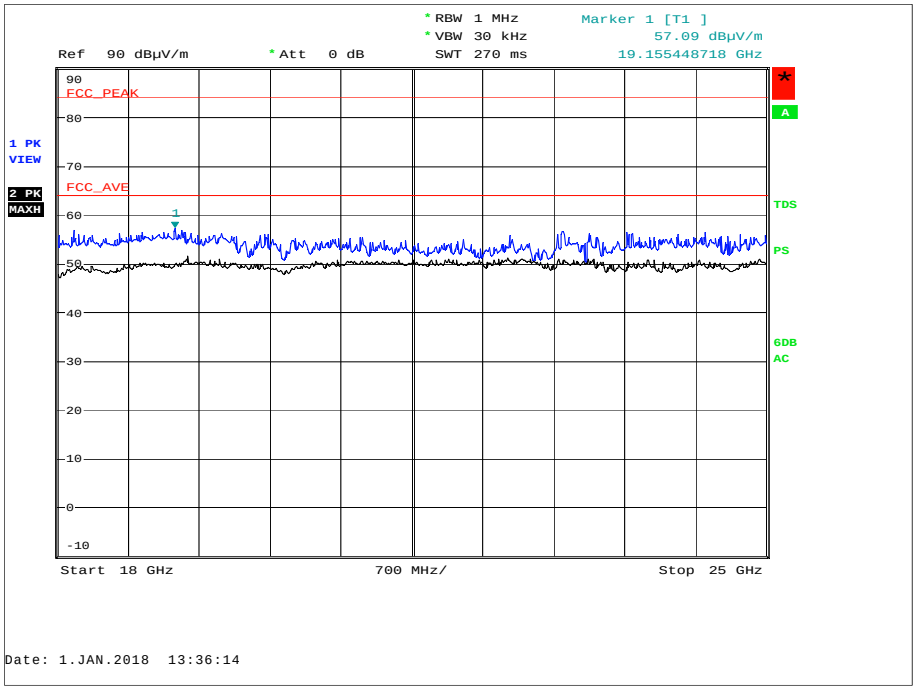

Figure 22 - 2440 MHz - 18 GHz to 25 GHz - Horizontal and Vertical

Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dBuV/m)	Angle(Deg)	Height(m)	Polarity
32.184	29.3	40.0	-10.7	135	1.00	Vertical
40.000	26.1	40.0	-13.9	360	1.00	Vertical
171.255	34.5	43.5	-9.0	142	1.49	Vertical
173.218	40.8	43.5	-2.7	84	1.80	Horizontal
599.978	34.7	46.0	-11.3	187	1.48	Horizontal
960.000	33.8	46.0	-12.2	264	1.00	Vertical

Table 21 - 2475 MHz - 30 MHz to 1 GHz Emissions Results

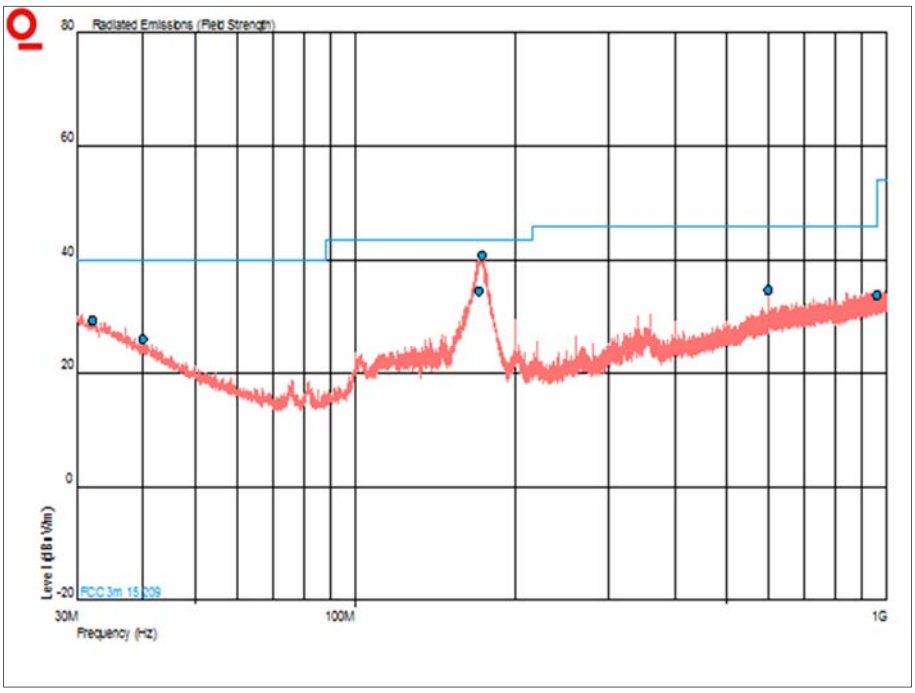

Figure 23 - 2475 MHz - 30 MHz to 1 GHz - Horizontal and Vertical

Frequency (GHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)	
	Peak	Average	Peak	Average	Peak	Average
4.949194	62.46	53.95	73.98	53.98	-11.52	-0.03
7.425022	61.25	52.50	73.98	53.98	-12.73	-1.48

Table 22 - 2475 MHz - 1 GHz to 25 GHz Emissions Results

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

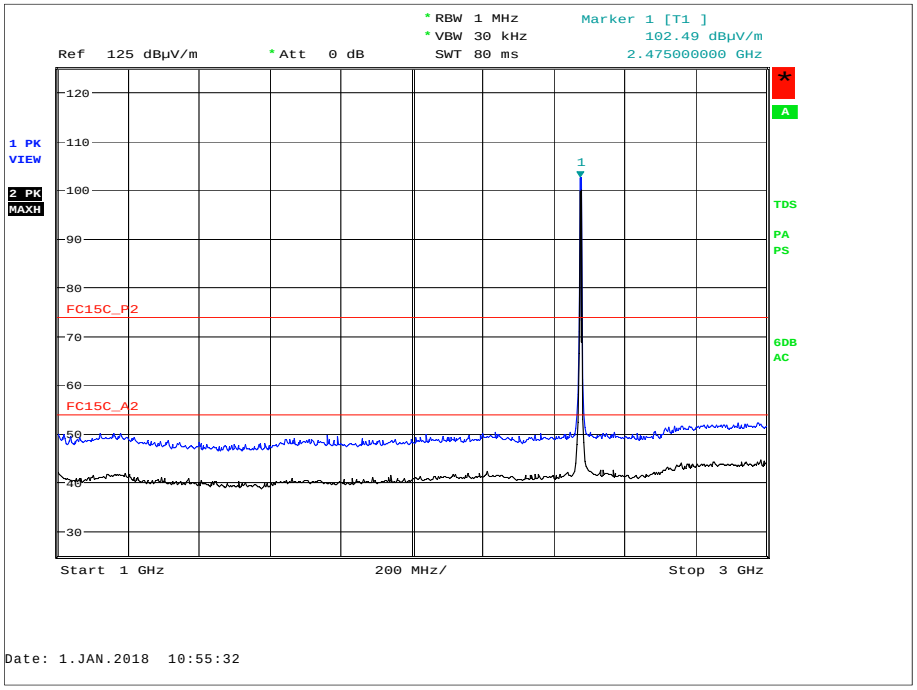

Figure 24 - 2475 MHz - 1 GHz to 3 GHz - Horizontal and Vertical

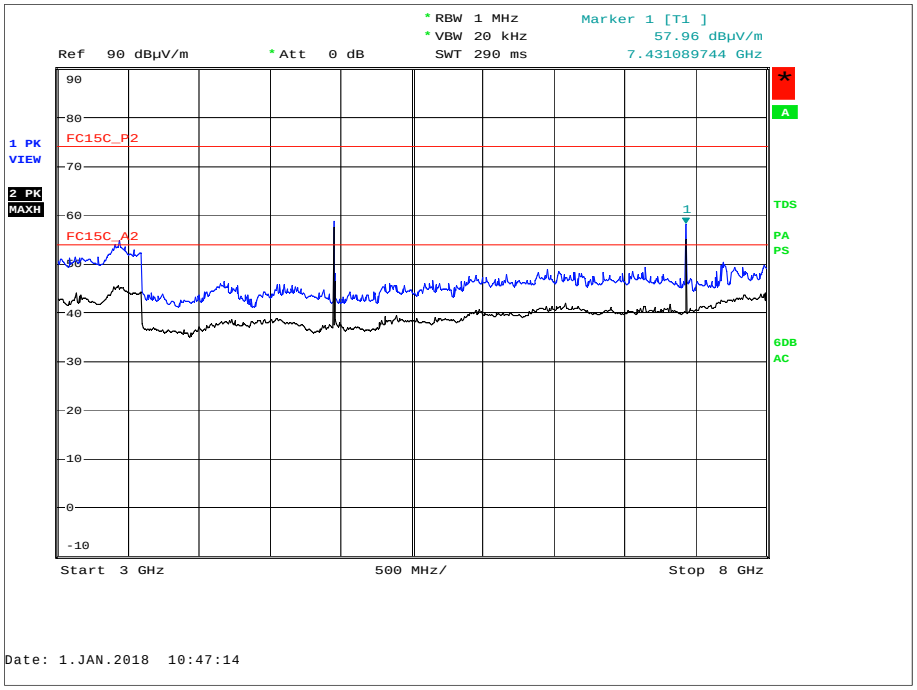

Figure 25 - 2475 MHz - 3 GHz to 8 GHz - Horizontal and Vertical

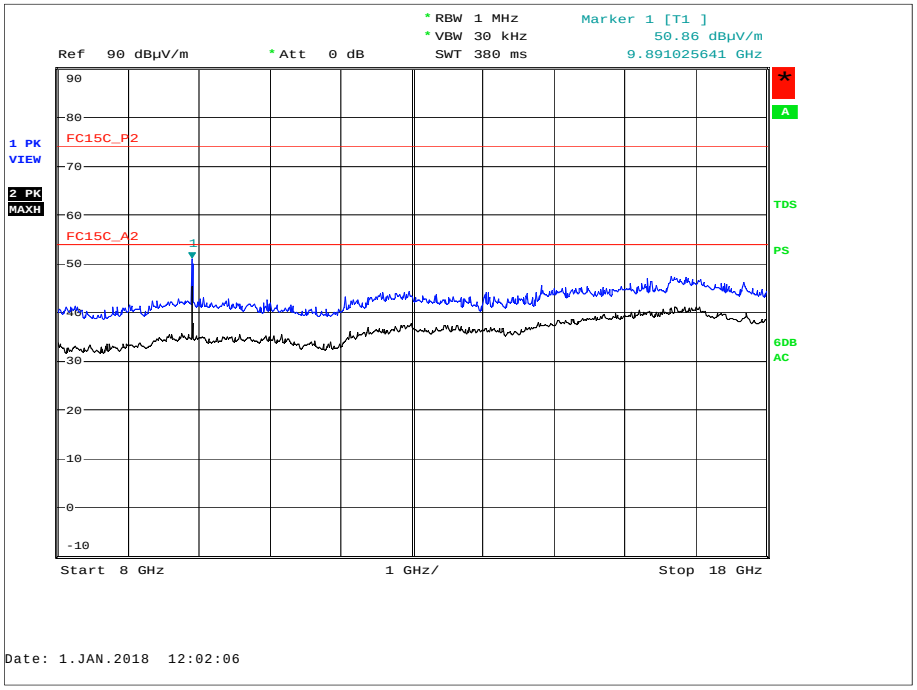

Figure 26 - 2475 MHz - 8 GHz to 18 GHz - Horizontal and Vertical

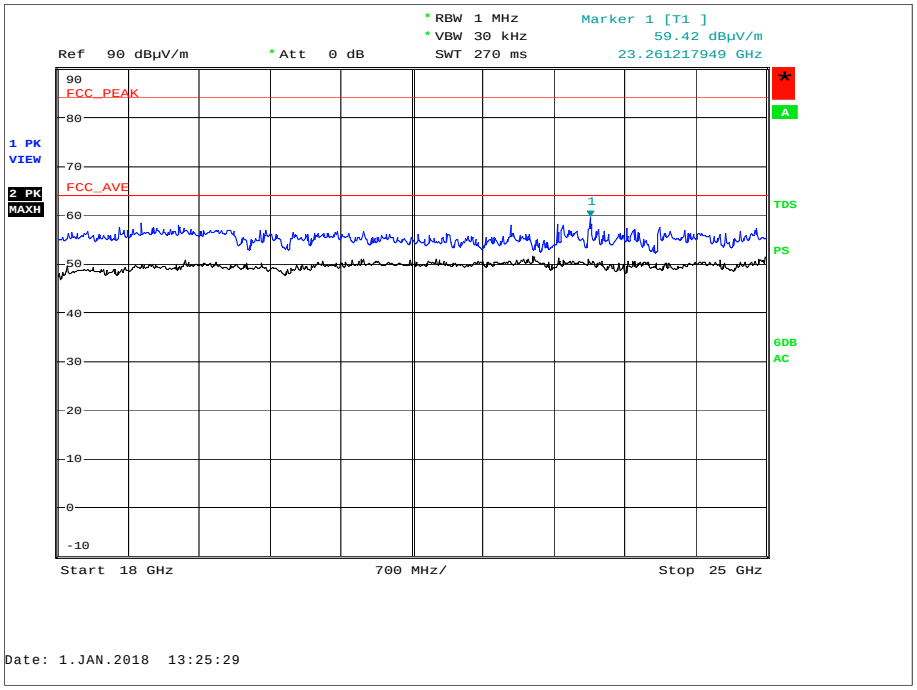

Figure 27 - 2475 MHz - 18 GHz to 25 GHz - Horizontal and Vertical

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

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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 the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in 15.209(a)

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.

2.6.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Antenna (Bilog)	Schaffner	CBL6143	287	24	18-Apr-2018
Antenna 18-40GHz (Double Ridge Guide)	Q-Par Angus Ltd	QSH 180K	1511	24	07-Dec-2018
Pre-Amplifier	Phase One	PS04-0086	1533	12	31-Jul-2018
18GHz - 40GHz Pre-Amplifier	Phase One	PSO4-0087	1534	12	23-Jan-2018
Screened Room (5)	Rainford	Rainford	1545	36	20-Jan-2018
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Cable (N-N, 8m)	Rhophase	NPS-2302-8000-NPS	3248	12	02-May-2018
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Nov-2018
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Cable 1503 2M 2.92(P)m 2.92(P)m	Rhophase	KPS-1503A-2000-KPS	4293	12	23-Jan-2018
Hygropalm Temperature and Humidity Meter	Rotronic	HP21	4410	12	04-May-2018
Suspended Substrate Highpass Filter	Advance Power Components	11SH10-3000/X18000-O/O	4412	12	03-Apr-2018
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	22-May-2018
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	17-Feb-2018
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	17-Feb-2018

Table 23

TU - Traceability Unscheduled

3 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Maximum Conducted Output Power	± 3.2 dB
Power Spectral Density	± 3.2 dB
Emission Bandwidth	± 58.64 kHz
Authorised Band Edges	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB
Restricted Band Edges	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB
Spurious Radiated Emissions	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB

Table 24