FCC 47 CFR PART 15 SUBPART C
INDUSTRY (ISED) CANADA RSS-247 ISSUE 1

BLUETOOTH LOW ENERGY CERTIFICATION TEST REPORT

FOR

NFC/ BLE CAPABLE ELECTRONIC DOOR-MOUNTED ACCESS CONTROL PRODUCT

MODEL NUMBER: M1

FCC ID: 2AK5B-M1
IC: 22134-M1

REPORT NUMBER: R11464238-E1

ISSUE DATE: 2017-01-03

Prepared for
LATCHABLE, INC.
450 WEST 33RD STREET, 12TH FLOOR
NEW YORK, NY 10001, USA

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NVLAP TESTING

NVLAP LAB CODE 200246-0

Revision History

Ver.	Issue Date	Revisions	Revised By
1	2016-11-29	Initial Issue	Brian Kiewra
2	2016-12-22	Corrected FCC-ID to 2AK5B-M1	Brian Kiewra
3	2017-01-03	Added “Note: Pre-scan plot taken at 1MHz/30kHz (RBW/VBW). Final measurements taken at 1MHz/3MHz (RBW/VBW).” to L/M/H radiated plots in 1-18GHz range. Corrected operating range on p. 7 to 2401.86 – 2479.87.	Brian Kiewra

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TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 4

2. TEST METHODOLOGY 5

3. FACILITIES AND ACCREDITATION 5

4. CALIBRATION AND UNCERTAINTY 5

4.1. MEASURING INSTRUMENT CALIBRATION 5

4.2. SAMPLE CALCULATION 5

4.3. MEASUREMENT UNCERTAINTY 6

5. EQUIPMENT UNDER TEST 7

5.1. DESCRIPTION OF EUT 7

5.2. MAXIMUM OUTPUT POWER 7

5.3. DESCRIPTION OF AVAILABLE ANTENNAS 7

5.4. SOFTWARE AND FIRMWARE 7

5.5. WORST-CASE CONFIGURATION AND MODE 8

5.6. DESCRIPTION OF TEST SETUP 8

6. TEST AND MEASUREMENT EQUIPMENT 10

7. MEASUREMENT METHODS 12

8. ANTENNA PORT TEST RESULTS 13

8.1. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS 13

8.2. 6 dB BANDWIDTH 14

8.3. 99% BANDWIDTH 17

8.4. OUTPUT POWER 20

8.5. AVERAGE POWER 21

8.6. POWER SPECTRAL DENSITY 22

8.7. CONDUCTED SPURIOUS EMISSIONS 25

9. RADIATED TEST RESULTS 29

9.1. LIMITS AND PROCEDURE 29

9.2. TX 1-18 GHz FOR BLUETOOTH LOW ENERGY MODE IN THE 2.4 GHz BAND 30

9.3. WORST-CASE ABOVE 18GHz 37

9.4. WORST-CASE BELOW 1 GHz 38

10. SETUP PHOTOS 40

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Latchable, Inc.
450 W. 33rd ST.,12th Floor
New York, NY 10001, USA

EUT DESCRIPTION: NFC/ BLE Capable Electronic Door-Mounted Access Control Product

MODEL: M1

SERIAL NUMBER: 290021000f51353235373138

DATE TESTED: 2016-11-01

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY (ISED) CANADA RSS-247 Issue 1	Pass
INDUSTRY (ISED) CANADA RSS-GEN Issue 4	Pass

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL LLC based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released
For UL LLC By:

Jeffrey Moser
EMC Program Manager
UL – Consumer Technology Division

Prepared By:

Brian T. Kiewra
EMC Engineer
UL – Consumer Technology Division

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, RSS-GEN Issue 4, RSS-247 Issue 1.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Dr., Research Triangle Park, NC 27709, USA and 2800 Suite B, Perimeter Park Drive, Morrisville, NC 27560.

12 Laboratory Dr., RTP, NC 27709
☐ Chamber A
☐ Chamber C

2800 Suite B Perimeter Park Dr., Morrisville, NC 27560
☐ Chamber NORTH
☒ Chamber SOUTH

The onsite chambers are covered under Industry (ISED) Canada company address code 2180C with site numbers 2180C -1 through 2180C-4, respectively.

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0. The full scope of accreditation can be viewed at http://www.nist.gov/nvlap/.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

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4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
RF output power, conducted	±0.45 dB
Power Spectral Density, conducted	±1.50 dB
Unwanted Emissions, conducted	±2.94 dB
All emissions, radiated	±5.36 dB
Conducted Emissions (0.150 – 30MHz)	±3.65 dB
Temperature	±0.07 °C
Humidity	±2.26 %
DC and Low Frequency Voltages	±1.27 %

Uncertainty figures are valid to a confidence level of 95%.

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an electronic door-mounted access control product that contains BLE and NFC radios.

The radio module is manufactured by Texas Instruments.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2401.86 - 2479.87	BLE	1.51	1.42

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a chip antenna, with a maximum gain of +1.69dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was revision 1.7.0.1.

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5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

EUT is only intended to operate installed in a door, which is a fixed orientation; therefore, all final radiated testing was performed in this position.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	Apple	Macbook	NA	NA

I/O CABLES

I/O Cable List						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	Antenna	1	SMA	RF	<1m	NA

TEST SETUP

The EUT is installed in as a standalone device. Test software exercised the radio card.

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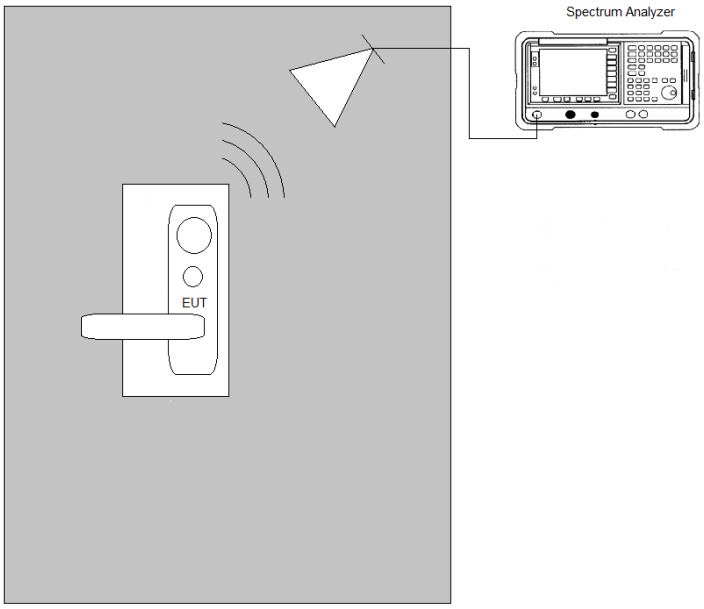
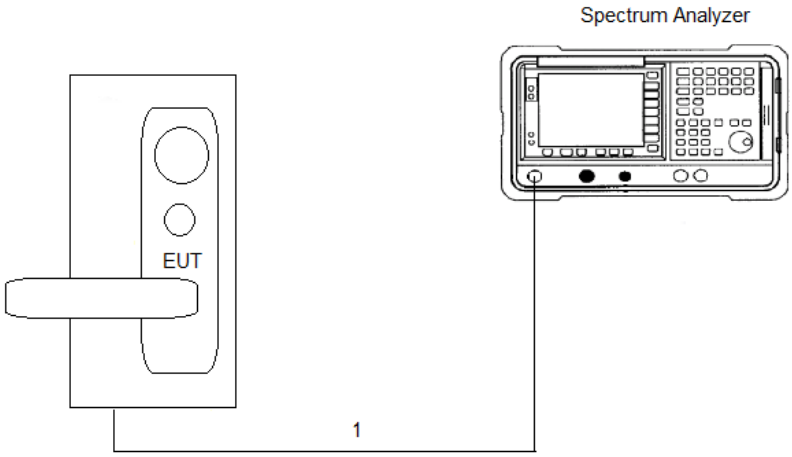
SETUP DIAGRAM FOR TESTS

Radiated Setup



Antenna Port Conducted Setup



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6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - South Chamber)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	0.009-30MHz	**(Loop Ant.)**			
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2015-12-08	2016-12-31
	30-1000 MHz				
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2016-06-07	2017-06-30
	1-18 GHz				
AT0069	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2016-03-07	2017-03-31
	18-26 GHz				
AT0076	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2016-09-06	2017-09-06
	Gain-Loss Chains				
S-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2016-10-04	2017-10-04
S-SAC02	Gain-loss string: 30-1000MHz	Various	Various	2016-06-26	2017-06-30
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2016-08-28	2017-08-28
S-SAC04	Gain-loss string: 18-40GHz	Various	Various	2016-02-29	2017-02-28
	Receiver & Software				
SA0025	Spectrum Analyzer	Agilent	N9030A	2016-03-17	2017-03-31
SA0026 (18-40GHz RSE)	Spectrum Analyzer	Agilent	N9030A	2016-02-24	2017-02-28
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Additional Equipment used				
139843	Temp/Humid/Pressure Meter	Control Co./Fisher	14-650-118	2016-02-19	2017-02-19

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Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 1				
72822 (SA0019)	Spectrum Analyzer	Agilent Technologies	E4446A	2016-08-25	2017-08-25
PWM004	RF Power Meter	Keysight Technologies	N1911A	2016-06-22	2017-06-22
PWS004	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2016-06-22	2017-06-22
139843	Temp/Humid/Pressure Meter	Control Co./Fisher	14-650-118	2016-02-19	2017-02-19
76022	DC Regulated Power Supply	CircuitSpecialists.Com	CSI3005X5	N/A	N/A
	Conducted Room 2				
SA0020	Spectrum Analyzer	Agilent Technologies	E4446A	2016-03-22	2017-03-31
PWM003	RF Power Meter	Keysight Technologies	N1911A	2016-06-21	2017-06-21
PWS003	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2016-06-21	2017-06-21
1100502	Temp/Humid Chamber	Cincinnati Sub-Zero	ZPH-8-3.5-SCT/AC	2016-06-06	2017-06-06
139843	Temp/Humid/Pressure Meter	Control Co./Fisher	14-650-118	2016-02-19	2017-02-19
76021	DC Regulated Power Supply	CircuitSpecialists.Com	CSI3005X5	N/A	N/A

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7. MEASUREMENT METHODS

On Time and Duty Cycle: KDB 558074, Section 6.0

6 dB BW: KDB 558074 D01 v03r05, Section 8.1.

99% Bandwidth: ANSI C63.10-2013, Sections 6.9.3

Output Power: KDB 558074 D01 v03r05, Section 9.1.2.

Power Spectral Density: KDB 558074 D01 v03r05, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r05, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r05, Section 12.1.

General Radiated Emissions: ANSI C63.10:2013 Sections 6.3-6.6

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8. ANTENNA PORT TEST RESULTS

8.1. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

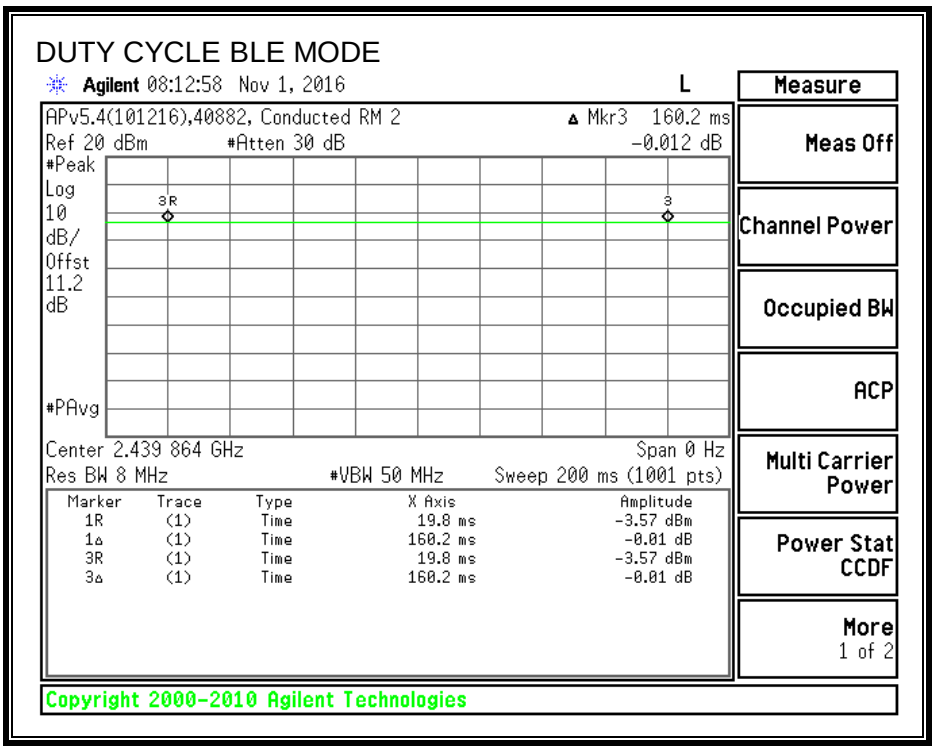
PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
BLE	160.200	160.200	1.000	100.00%	0.00	0.010

DUTY CYCLE PLOTS



Test Information

Tester: Jeff Cabrera
Date: 2016-11-01

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8.2. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-247 5.2 (1)

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

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2401.860	0.7100	0.5
Middle	2439.864	0.6880	0.5
High	2479.870	0.7360	0.5

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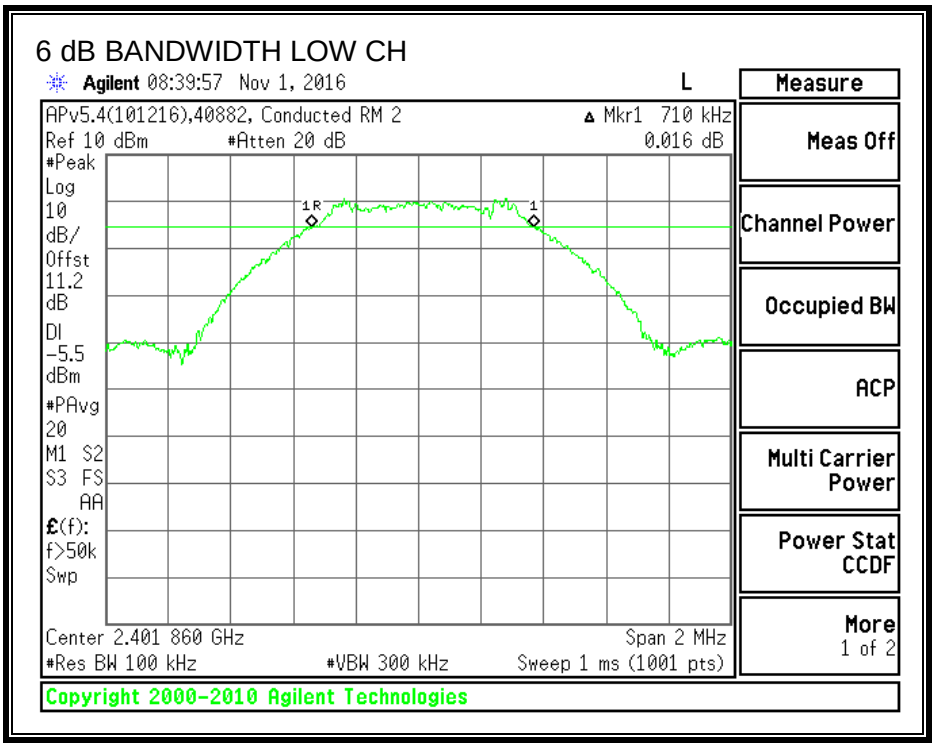
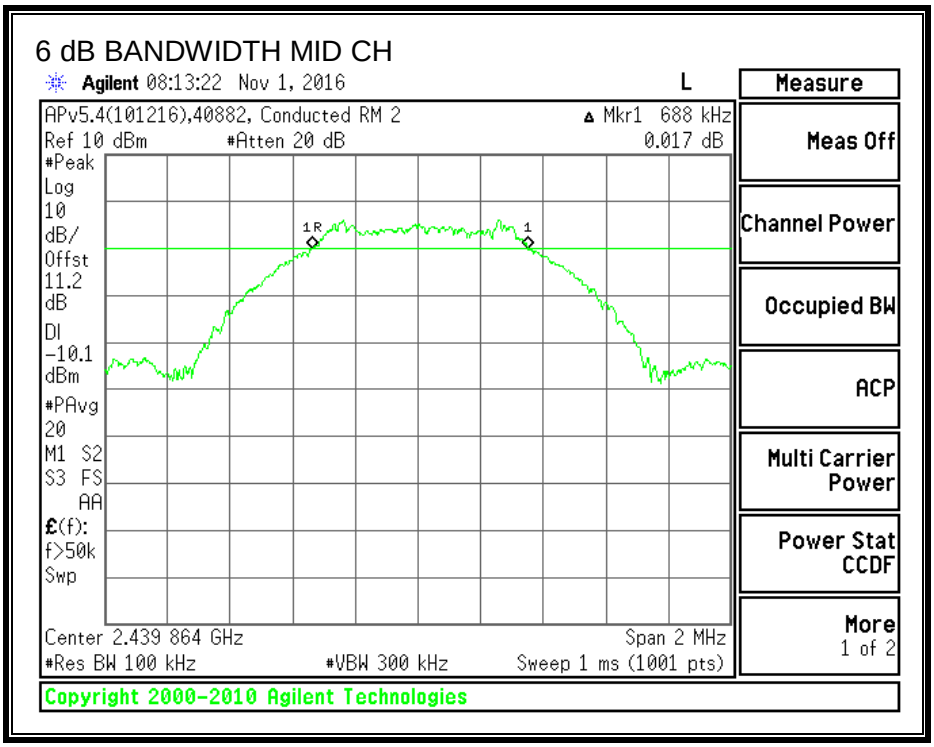
6 dB BANDWIDTH





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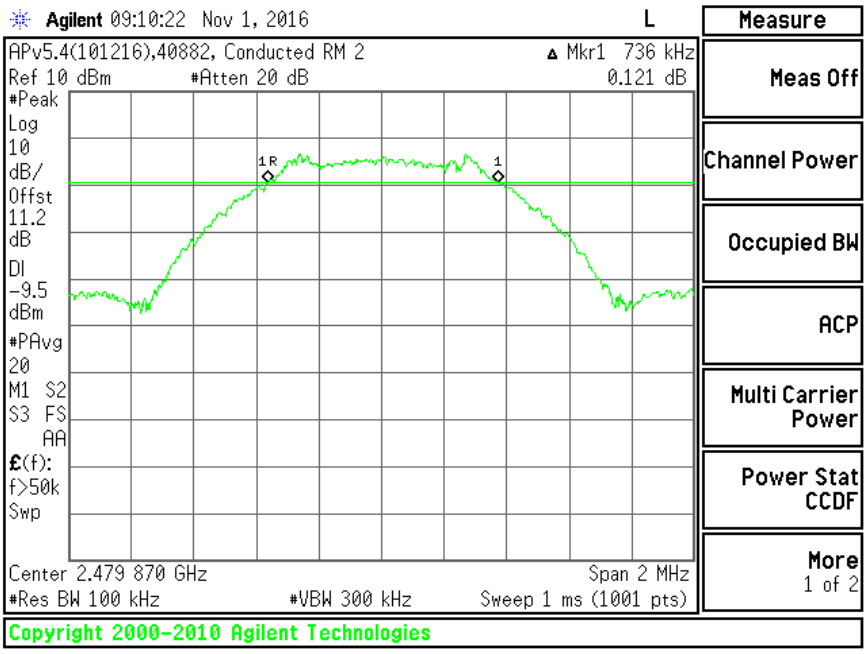
6 dB BANDWIDTH HIGH CH



Test Information

Tester: Jeffrey Cabrera
Date: 2016-11-01

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8.3. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.
Testing per RSS-Gen Clause 6.6.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 5% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2401.860	1.0487
Middle	2439.864	1.0526
High	2479.870	1.0619

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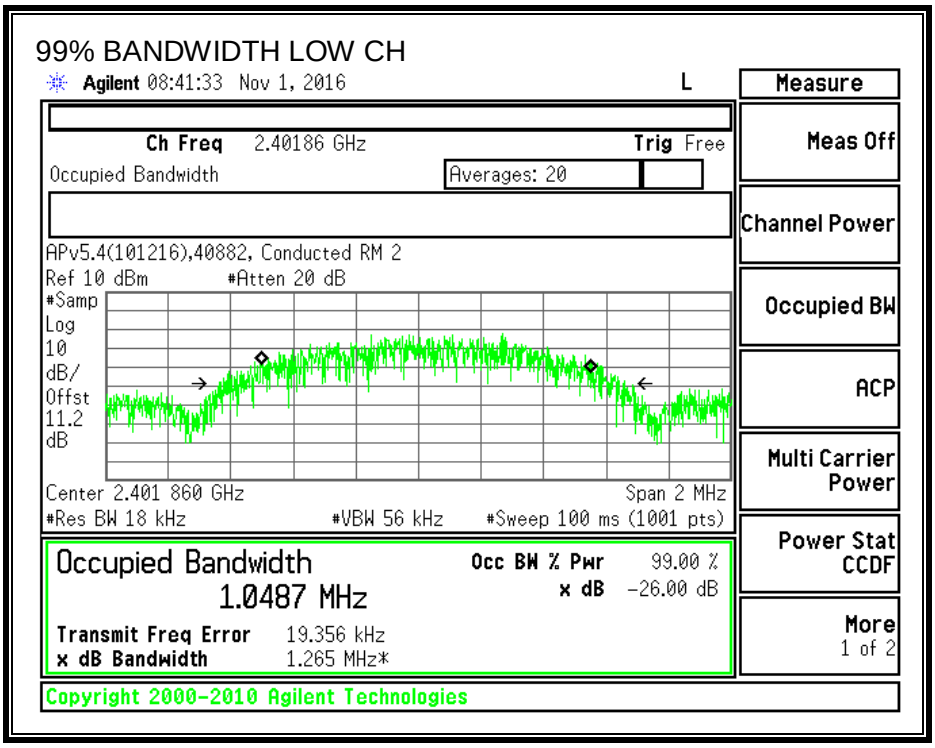
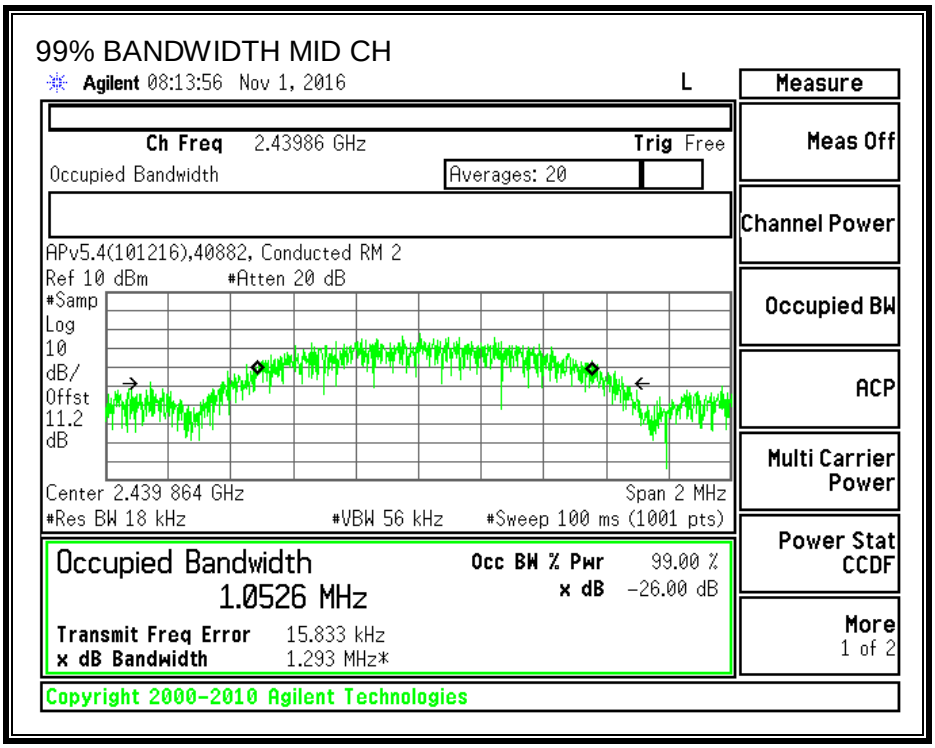
99% BANDWIDTH





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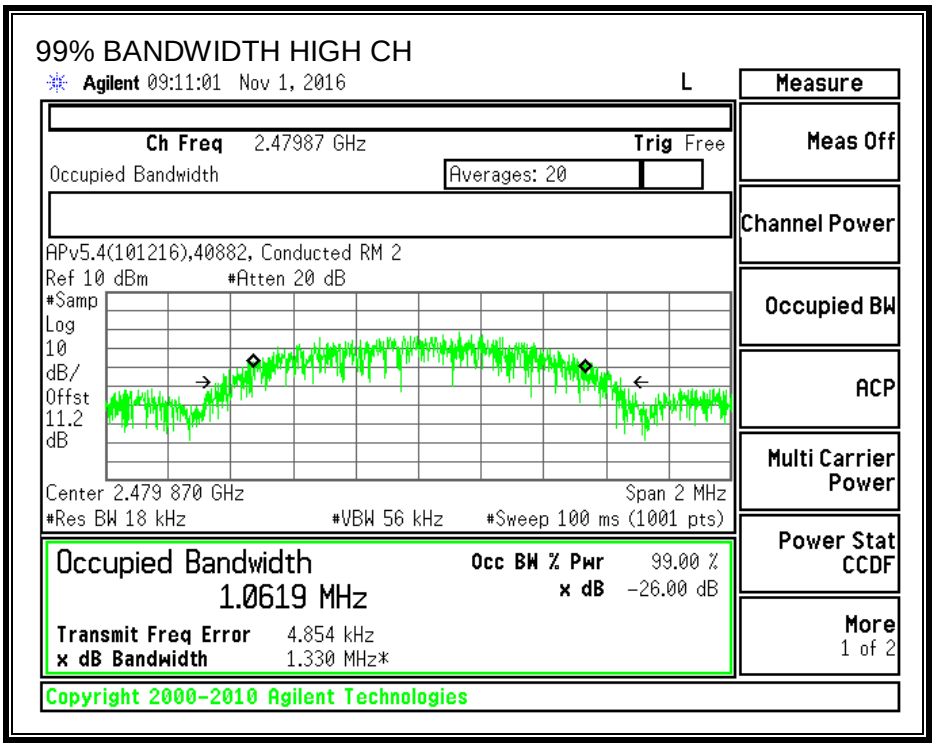

Test Information

Tester: Jeffrey Cabrera
Date: 2016-11-01

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8.4. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-247 5.4 (4)

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2401.860	1.510	30	-28.490
Middle	2439.864	1.230	30	-28.770
High	2479.870	1.320	30	-28.680

Test Information

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Date: 2016-11-01

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8.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

The cable assembly insertion loss of 11.17 dB (including 10 dB pad and 1.17 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	AV power (dBm)
Low	2401.860	1.12
Middle	2439.864	1.00
High	2479.870	0.97

Test Information

Tester: Jeffrey Cabrera
Date: 2016-11-01

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8.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-247 5.2 (2)

The 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.

RESULTS

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2401.860	-15.06	8	-23.06
Middle	2439.864	-14.05	8	-22.05
High	2479.870	-13.84	8	-21.84

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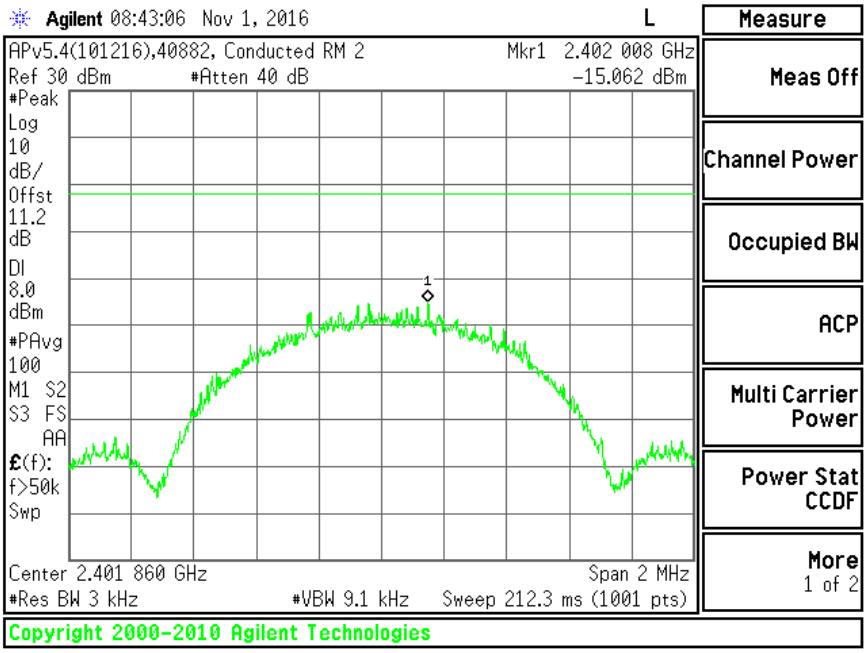
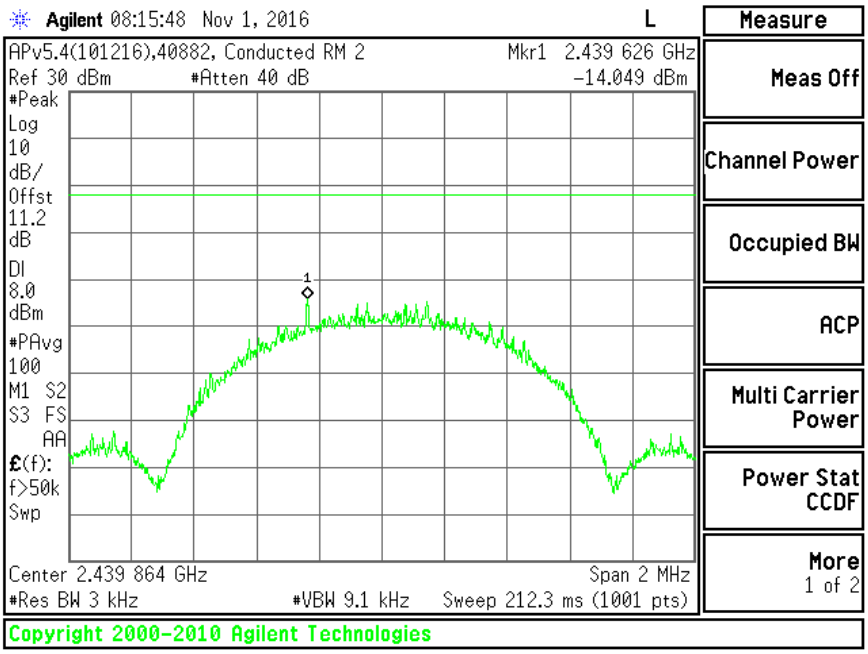
POWER SPECTRAL DENSITY

PSD LOW CH



PSD MID CH



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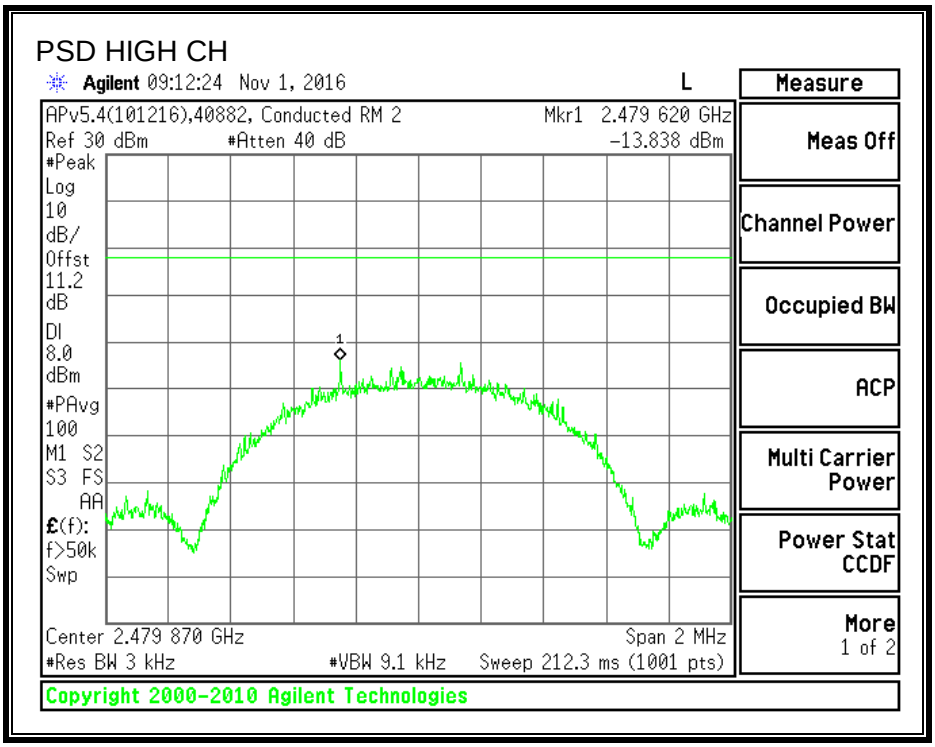

Test Information

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Date: 2016-11-01

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8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

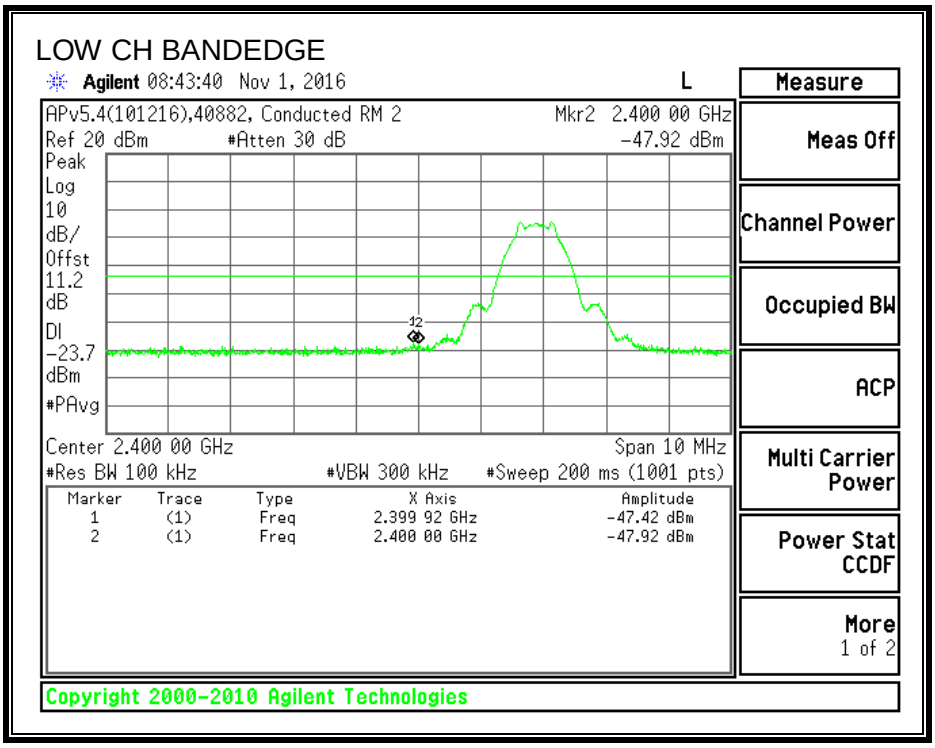
FCC §15.247 (d)

IC RSS-247 5.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL



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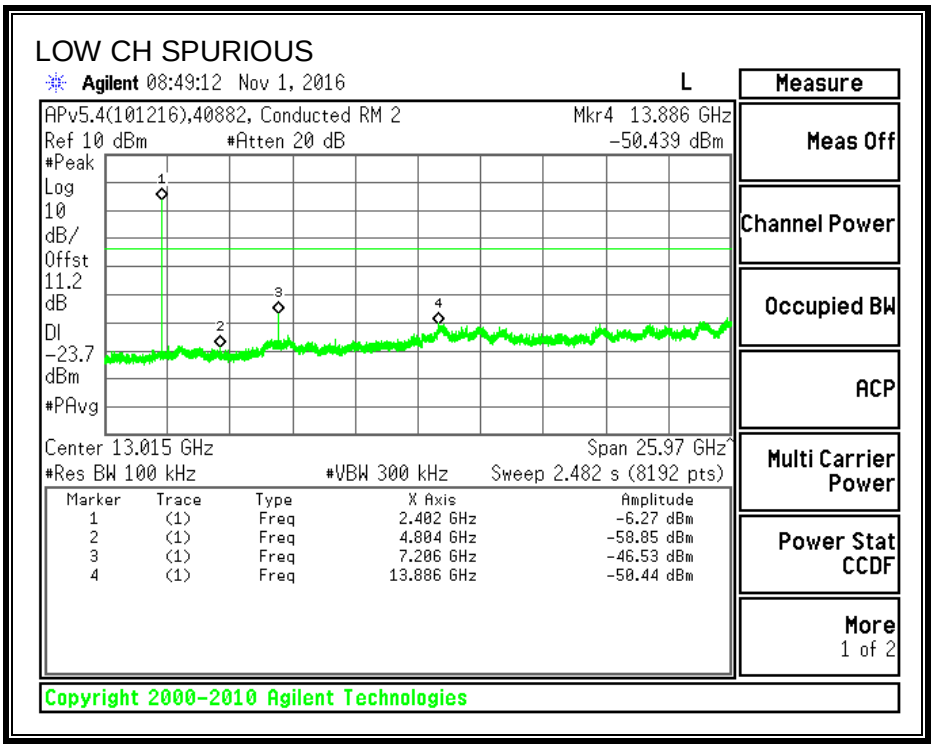
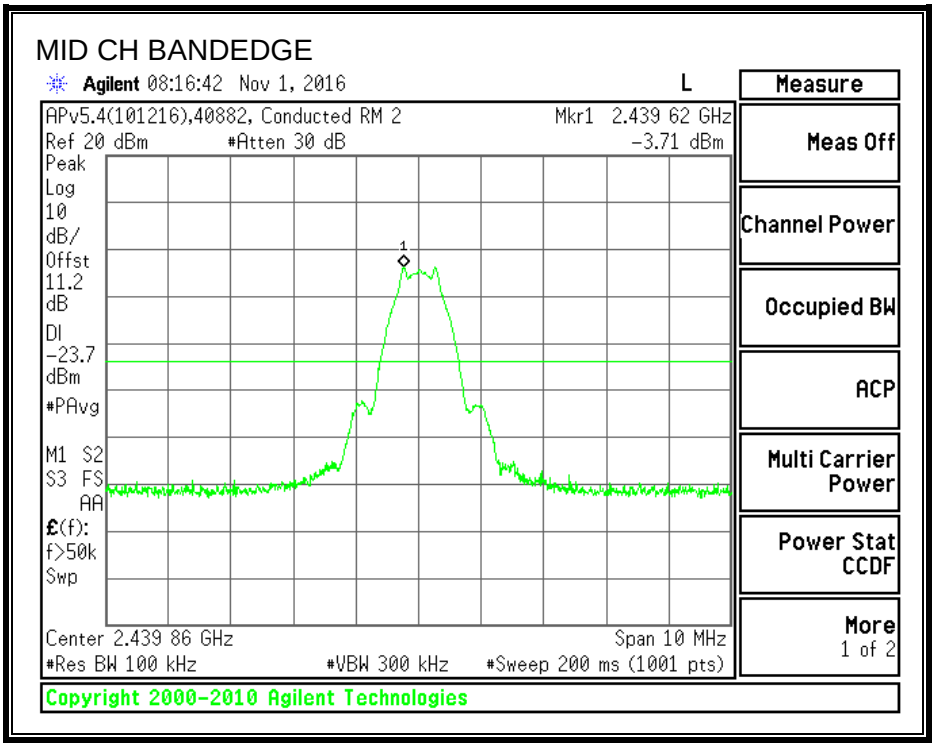


SPURIOUS EMISSIONS, MID CHANNEL



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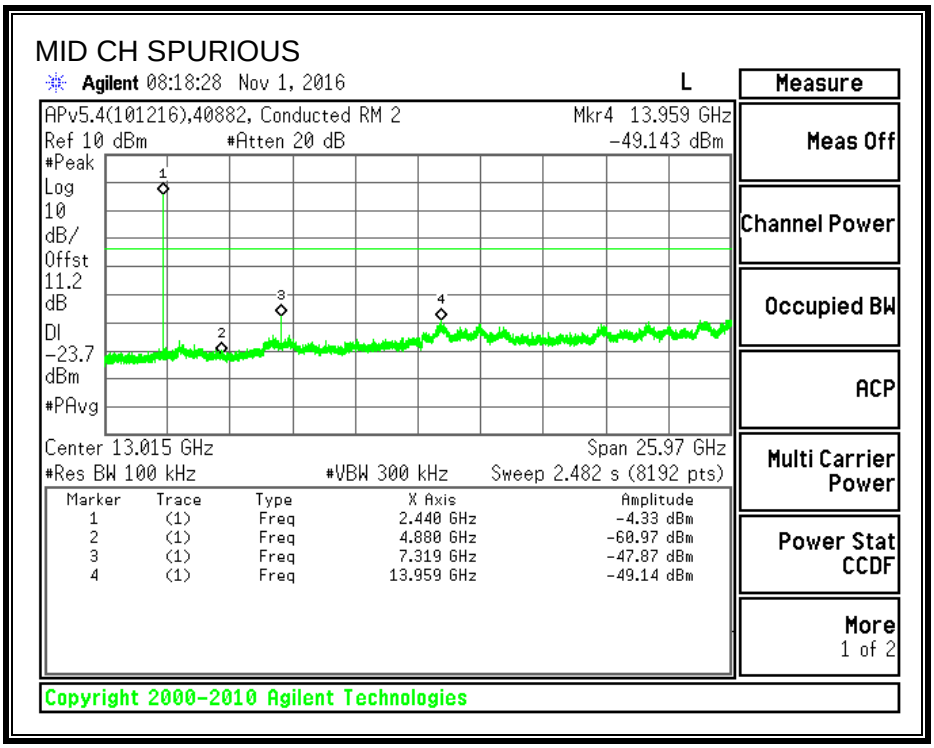
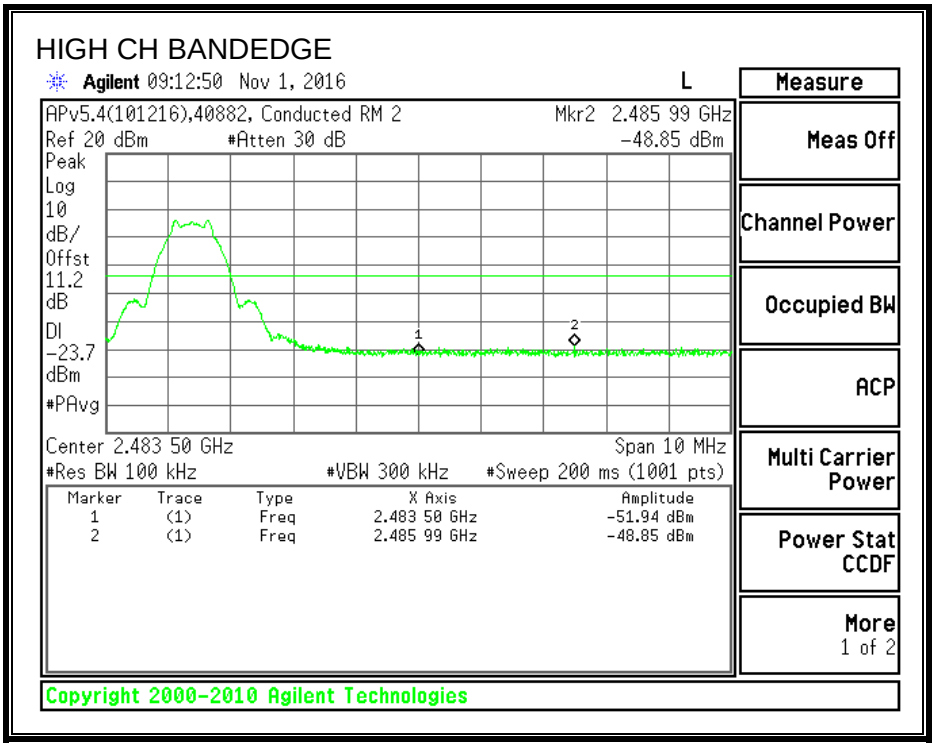


SPURIOUS EMISSIONS, HIGH CHANNEL



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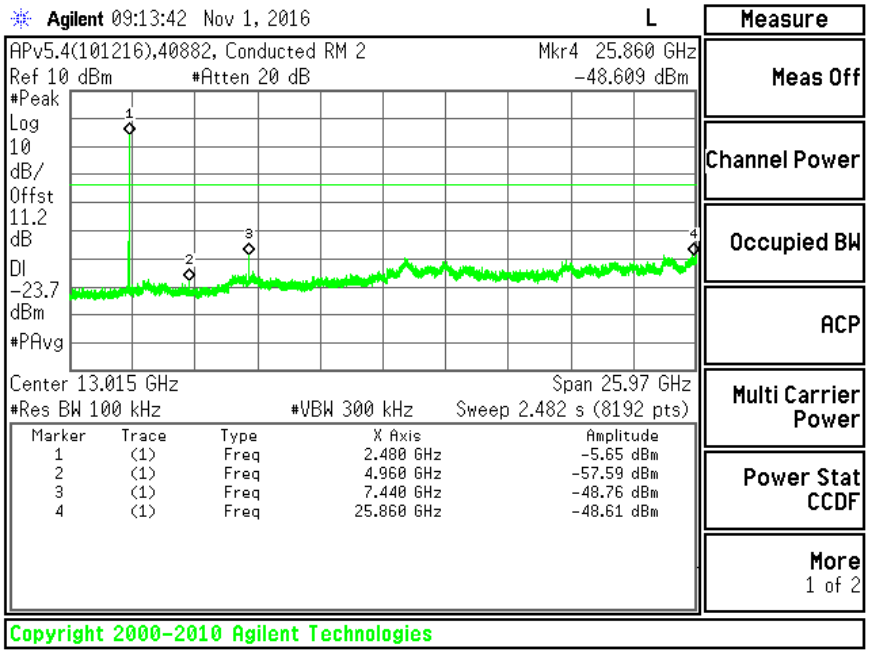
HIGH CH SPURIOUS



Test Information

Tester: Jeffrey Cabrera
Date: 2016-11-01

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9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205, §15.209, §15.247 (d)
IC RSS-GEN Clause 8.9 (Transmitter)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz measurements and 1.5 m above the ground plane for above 1GHz measurements. The antenna to EUT distance is 3 meters.

For measurements below 1 GHz the resolution bandwidth is set to 120 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements for the 30-1000 MHz range, 9 kHz for peak detection measurements or 9 kHz for quasi-peak detection measurements for the 0.15-30 MHz range and 200 Hz for peak detection measurements or 200 Hz for quasi-peak detection measurements for the 9 to 150 kHz range. Peak detection is used unless otherwise noted as quasi-peak.

For peak measurements above 1 GHz, the resolution bandwidth is set to 1 MHz and the video bandwidth is set to 3 MHz. For average measurements above 1GHz, the resolution bandwidth and video bandwidth are set as described in ANSI C63.10:2013 for the applicable measurement. For this evaluation, RMS Power Averaging was used and the resolution/video bandwidth settings were 1MHz/3MHz.

The spectrum from 9kHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

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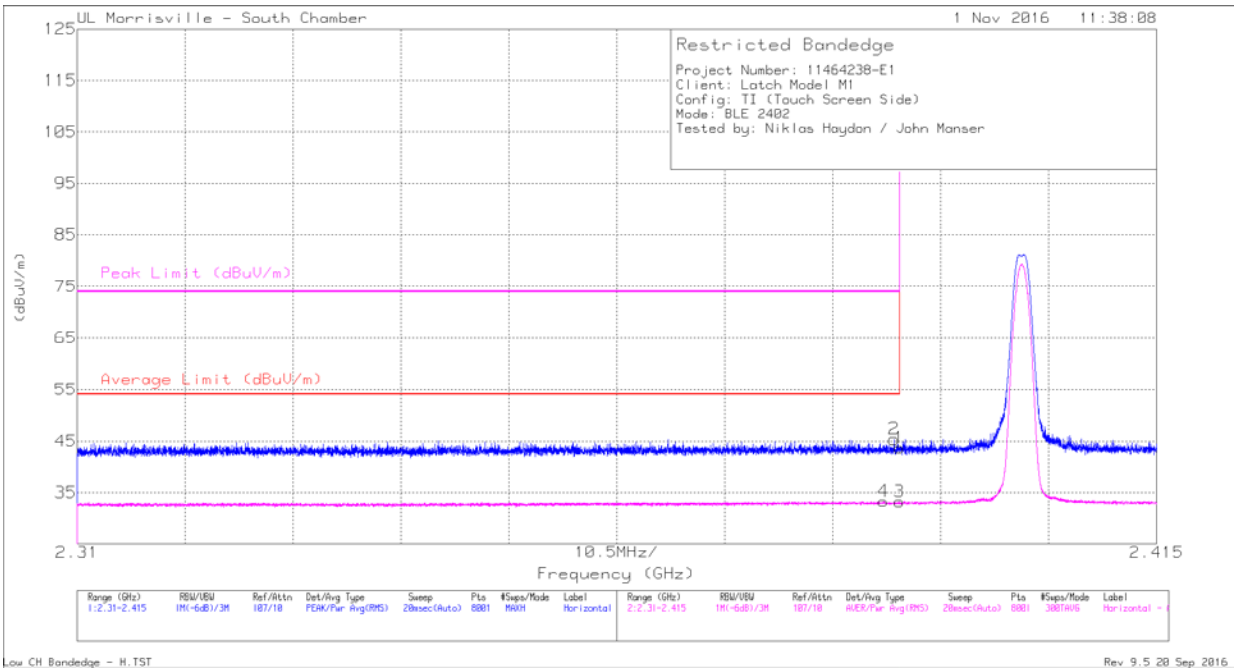
9.2. TX 1-18 GHz FOR BLE MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0069 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	35.55	Pk	32.2	-24.1	0	43.65	-	-	74	-30.35	89	207	H
2	* 2.389	37.27	Pk	32.2	-24.1	0	45.37	-	-	74	-28.63	89	207	H
3	* 2.39	25.11	RMS	32.2	-24.1	0	33.21	54	-20.79	-	-	89	207	H
4	* 2.388	25.19	RMS	32.2	-24.1	0	33.29	54	-20.71	-	-	89	207	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

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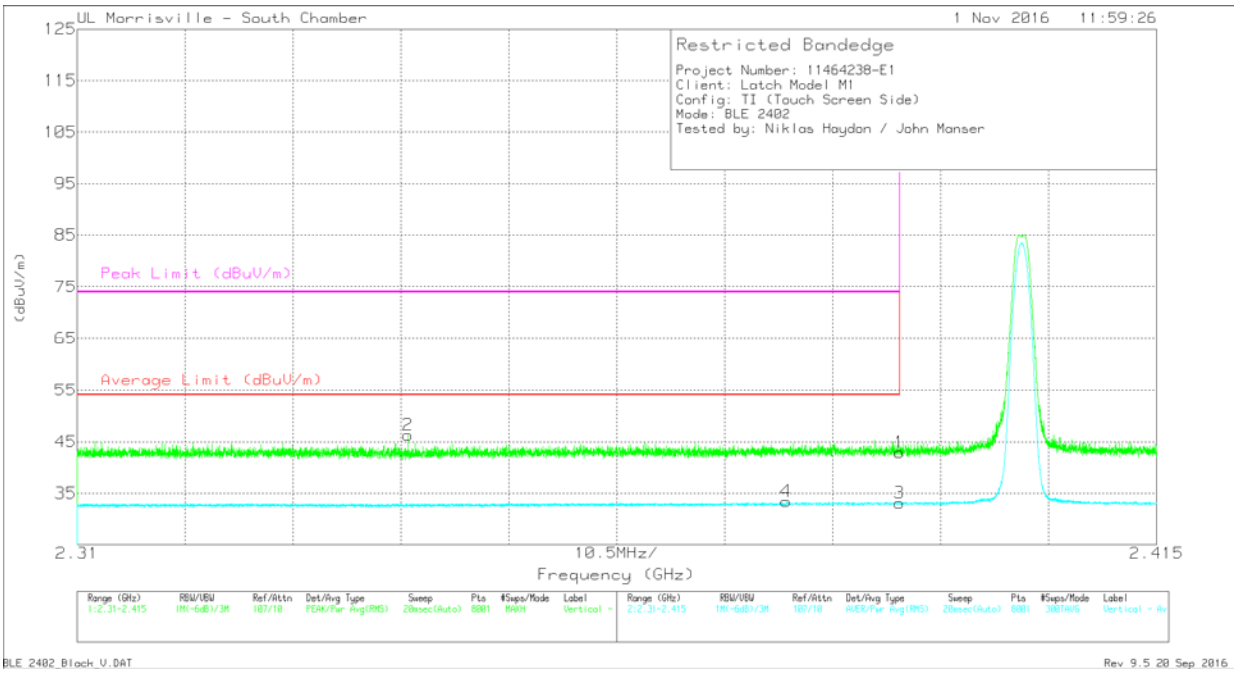
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0069 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	34.81	Pk	32.2	-24.1	0	42.91	-	-	74	-31.09	30	215	V
2	* 2.342	38.25	Pk	31.8	-23.8	0	46.25	-	-	74	-27.75	30	215	V
3	* 2.39	24.99	RMS	32.2	-24.1	0	33.09	54	-20.91	-	-	30	215	V
4	* 2.379	25.32	RMS	32.1	-24	0	33.42	54	-20.58	-	-	30	215	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

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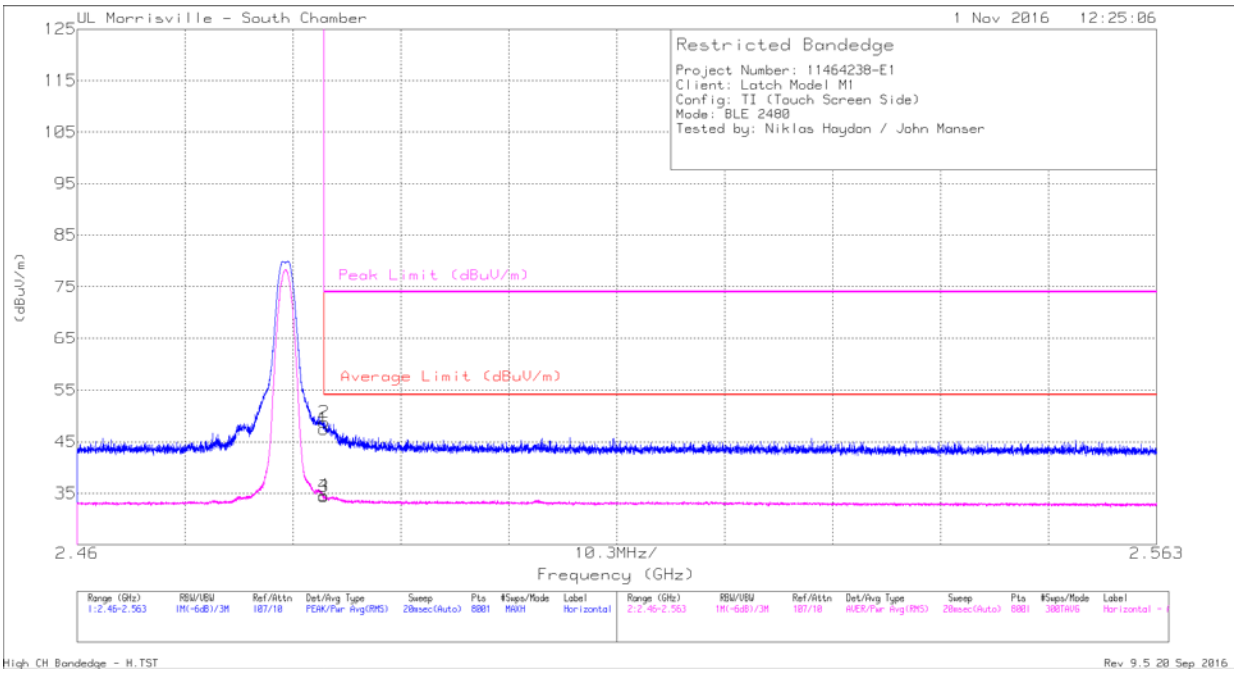
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0069 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	39.67	Pk	32.4	-24.6	0	47.47	-	-	74	-26.53	1	386	H
2	* 2.484	40.95	Pk	32.4	-24.6	0	48.75	-	-	74	-25.25	1	386	H
3	* 2.484	26.54	RMS	32.4	-24.6	0	34.34	54	-19.66	-	-	1	386	H
4	* 2.484	26.82	RMS	32.4	-24.6	0	34.62	54	-19.38	-	-	1	386	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

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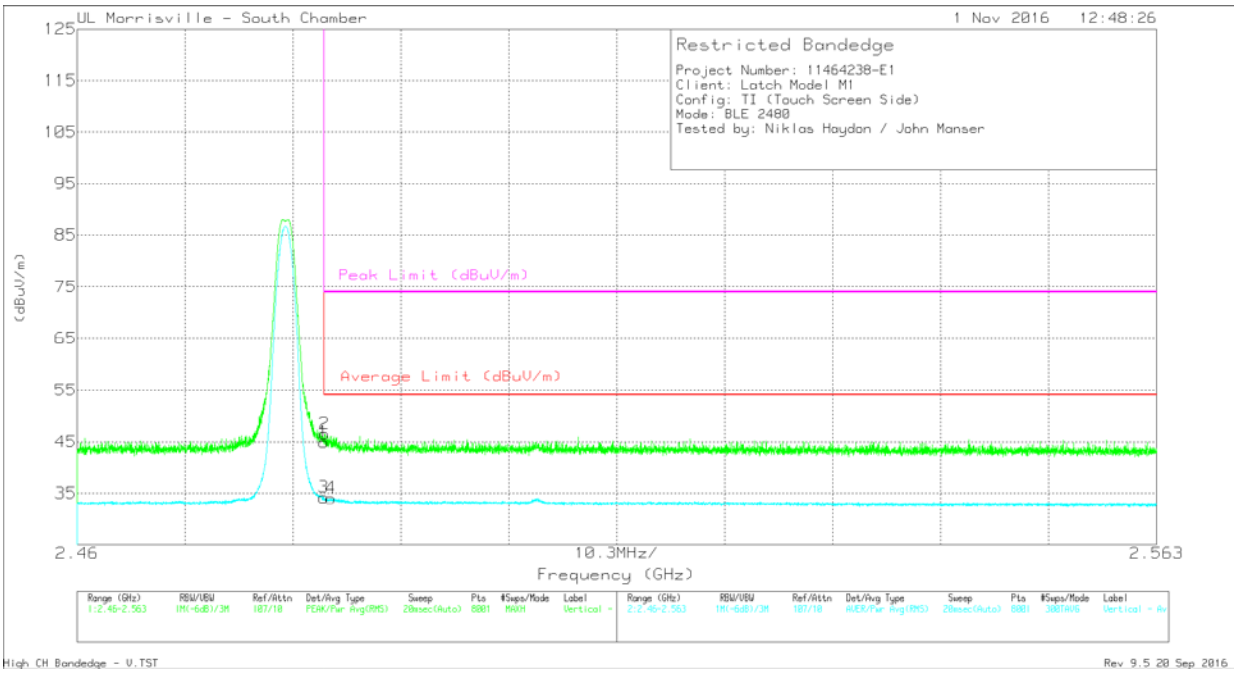
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0069 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	37.13	Pk	32.4	-24.6	0	44.93	-	-	74	-29.07	19	195	V
2	* 2.484	38.7	Pk	32.4	-24.6	0	46.5	-	-	74	-27.5	19	195	V
3	* 2.484	26.39	RMS	32.4	-24.6	0	34.19	54	-19.81	-	-	19	195	V
4	* 2.484	26.23	RMS	32.4	-24.6	0	34.03	54	-19.97	-	-	19	195	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

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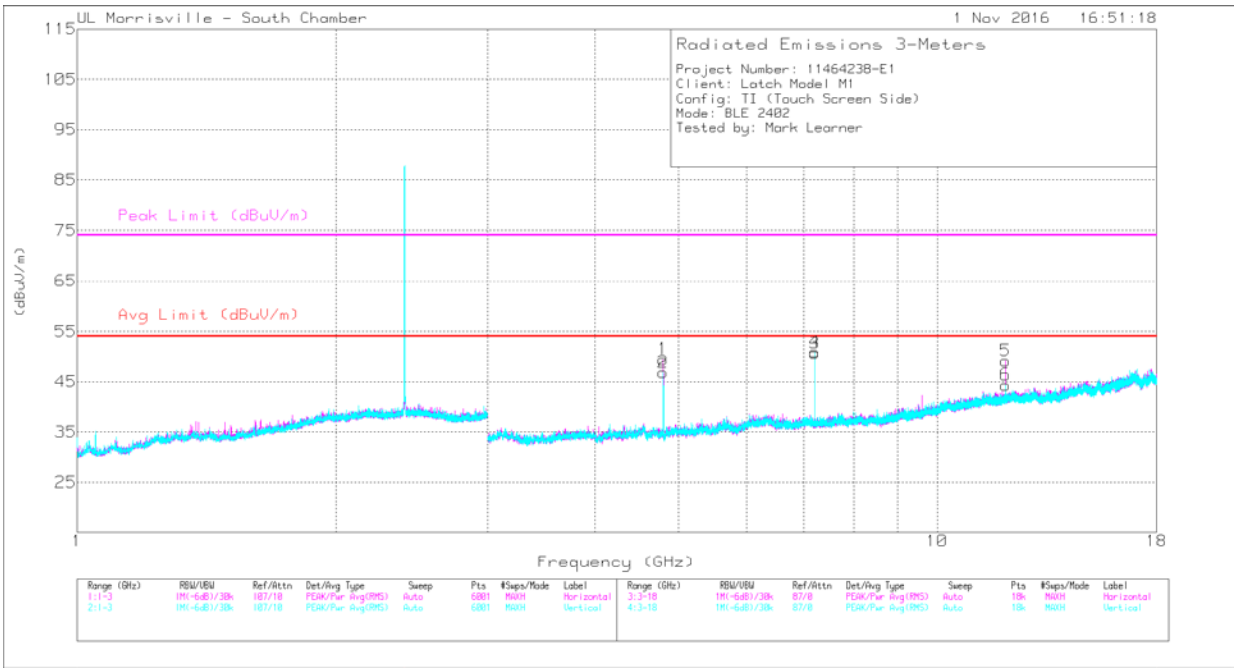
HARMONICS AND SPURIOUS EMISSIONS

Low Channel



Note: Pre-scan plot taken at 1MHz/30kHz (RBW/VBW). Final measurements taken at 1MHz/3MHz (RBW/VBW).

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0069 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.804	50.49	PK2	34	-31.1	0	53.39	-	-	74	-20.61	154	190	H
	* 4.803	45.22	MAv1	34	-31.1	0	48.12	54	-5.88	-	-	154	190	H
5	* 12.008	39.92	PK2	38.9	-24.3	0	54.52	-	-	74	-19.48	248	206	H
	* 12.01	32.04	MAv1	38.9	-24.3	0	46.64	54	-7.36	-	-	248	206	H
2	* 4.804	50.51	PK2	34	-31.1	0	53.41	-	-	74	-20.59	236	266	V
	* 4.803	45.21	MAv1	34	-31.1	0	48.11	54	-5.89	-	-	236	266	V
6	* 12.011	36.36	PK2	38.9	-24.3	0	50.96	-	-	74	-23.04	224	102	V
	* 12.008	25.12	MAv1	38.9	-24.3	0	39.72	54	-14.28	-	-	224	102	V
3	7.205	43.32	Pk	35.6	-28.3	0	50.62	-	-	-	-	0-360	101	H
4	7.206	43.55	Pk	35.6	-28.3	0	50.85	-	-	-	-	0-360	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
MAv1 - Maximum RMS Average

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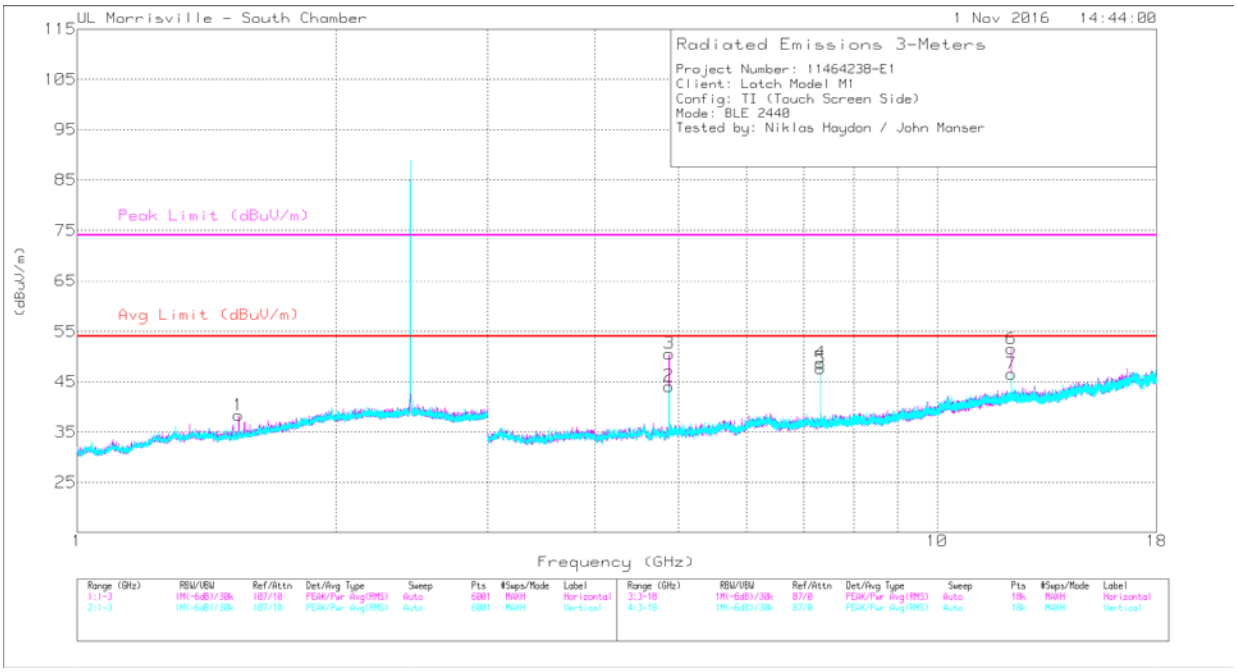
Mid Channel



Note: Pre-scan plot taken at 1MHz/30kHz (RBW/VBW). Final measurements taken at 1MHz/3MHz (RBW/VBW).

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0069 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.541	38.22	PK2	28.1	-22.4	0	43.92	-	-	74	-30.08	205	139	H
	* 1.54	28.93	MAv1	28.1	-22.4	0	34.63	54	-19.37	-	-	205	139	H
3	* 4.88	50.48	PK2	34.1	-31	0	53.58	-	-	74	-20.42	177	218	H
	* 4.88	45.62	MAv1	34.1	-31	0	48.72	54	-5.28	-	-	177	218	H
5	* 7.319	46.1	PK2	35.5	-27.9	0	53.7	-	-	74	-20.3	281	287	H
	* 7.32	40	MAv1	35.5	-27.9	0	47.6	54	-6.4	-	-	281	287	H
6	* 12.198	39.5	PK2	39	-24.5	0	54	-	-	74	-20	241	174	H
	* 12.198	31.07	MAv1	39	-24.5	0	45.57	54	-8.43	-	-	241	174	H
2	* 4.879	46.85	PK2	34.1	-31	0	49.95	-	-	74	-24.05	261	127	V
	* 4.879	40.48	MAv1	34.1	-31	0	43.58	54	-10.42	-	-	261	127	V
4	* 7.319	44.53	PK2	35.5	-27.9	0	52.13	-	-	74	-21.87	238	108	V
	* 7.319	37.68	MAv1	35.5	-27.9	0	45.28	54	-8.72	-	-	238	108	V
7	* 12.2	36.95	PK2	39	-24.5	0	51.45	-	-	74	-22.55	230	112	V
	* 12.201	27.36	MAv1	39	-24.5	0	41.86	54	-12.14	-	-	230	112	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
MAv1 - Maximum RMS Average

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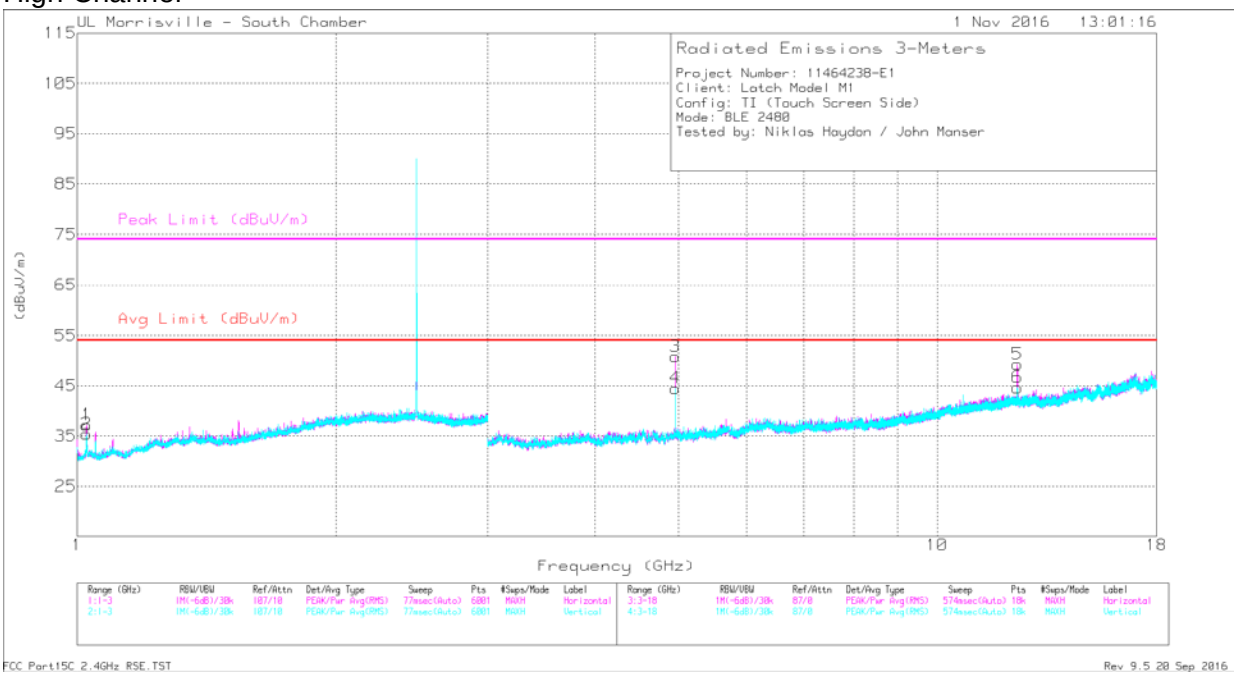
High Channel



Note: Pre-scan plot taken at 1MHz/30kHz (RBW/VBW). Final measurements taken at 1MHz/3MHz (RBW/VBW).

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0069 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.025	39.79	PK2	27.4	-24.7	0	42.49	-	-	74	-31.51	352	106	H
	* 1.025	32.76	MAv1	27.4	-24.7	0	35.46	54	-18.54	-	-	352	106	H
3	* 4.959	51.68	PK2	34.1	-31.3	0	54.48	-	-	74	-19.52	4	227	H
	* 4.96	46.67	MAv1	34.1	-31.3	0	49.47	54	-4.53	-	-	4	227	H
5	* 12.398	40.36	PK2	39	-24.5	0	54.86	-	-	74	-19.14	69	196	H
	* 12.398	32.31	MAv1	39	-24.5	0	46.81	54	-7.19	-	-	69	196	H
2	* 1.025	38.25	PK2	27.4	-24.7	0	40.95	-	-	74	-33.05	223	209	V
	* 1.025	30.81	MAv1	27.4	-24.7	0	33.51	54	-20.49	-	-	223	209	V
4	* 4.96	44.44	PK2	34.1	-31.3	0	47.24	-	-	74	-26.76	83	114	V
	* 4.959	36.33	MAv1	34.1	-31.3	0	39.13	54	-14.87	-	-	83	114	V
6	* 12.398	38.53	PK2	39	-24.5	0	53.03	-	-	74	-20.97	70	118	V
	* 12.398	28.88	MAv1	39	-24.5	0	43.38	54	-10.62	-	-	70	118	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - Maximum Peak
MAv1 - Maximum RMS Average

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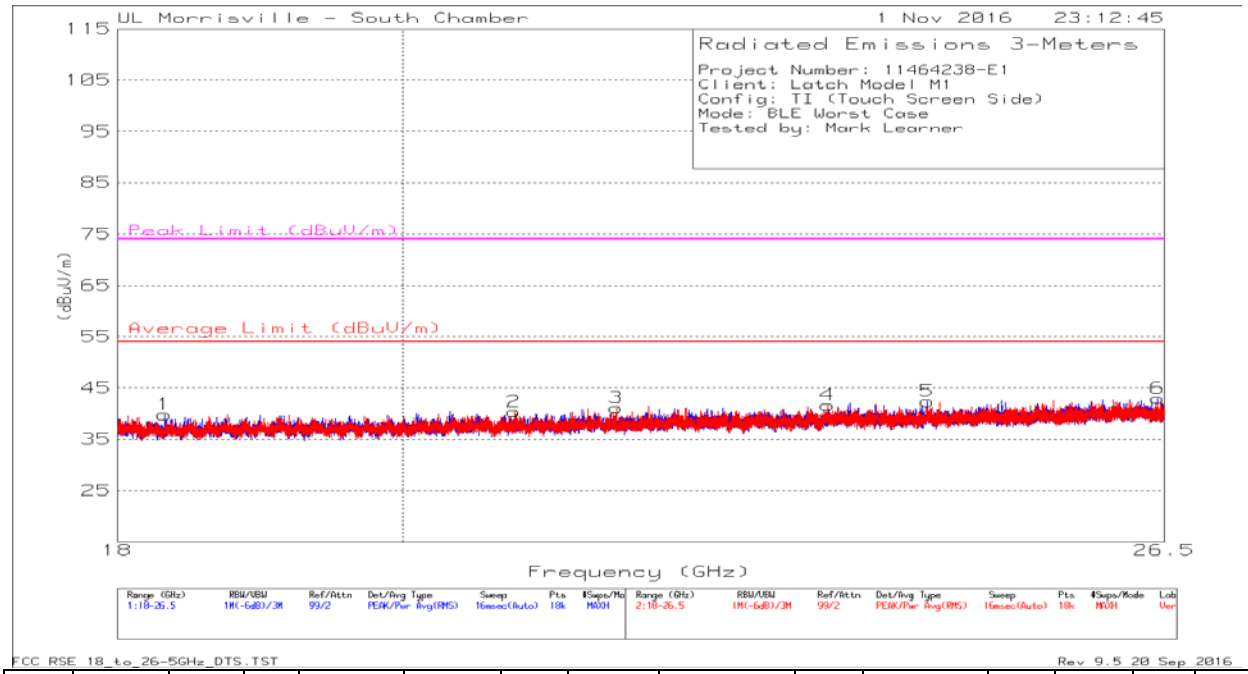
9.3. WORST-CASE ABOVE 18GHz

SPURIOUS EMISSIONS 18-26GHz (WORST-CASE CONFIGURATION)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0076 (dB/m)	Amp/Cbl (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 18.318	47.02	PK2	32.5	-40.9	0	38.62	54	-15.38	74	-35.38	36	185	H
	* 18.316	36.47	MAv1	32.5	-40.9	0	28.07	54	-25.93	-	-	36	185	H
2	* 20.842	46.94	PK2	33.2	-40.1	0	40.04	54	-13.96	74	-33.96	125	231	V
	* 20.842	35.95	MAv1	33.2	-40.1	0	29.05	54	-24.95	-	-	125	231	V
3	21.644	48.07	Pk	33.4	-40.3	0	41.17	54	-12.83	74	-32.83	0-360	199	V
4	23.403	46.78	Pk	34.1	-39.2	0	41.68	54	-12.32	74	-32.32	0-360	299	V
5	24.28	47.02	Pk	34.1	-38.7	0	42.42	54	-11.58	74	-31.58	0-360	233	H
6	26.437	45.68	Pk	34.6	-37.3	0	42.98	54	-11.02	74	-31.02	0-360	233	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
MAv1 - Maximum RMS Average

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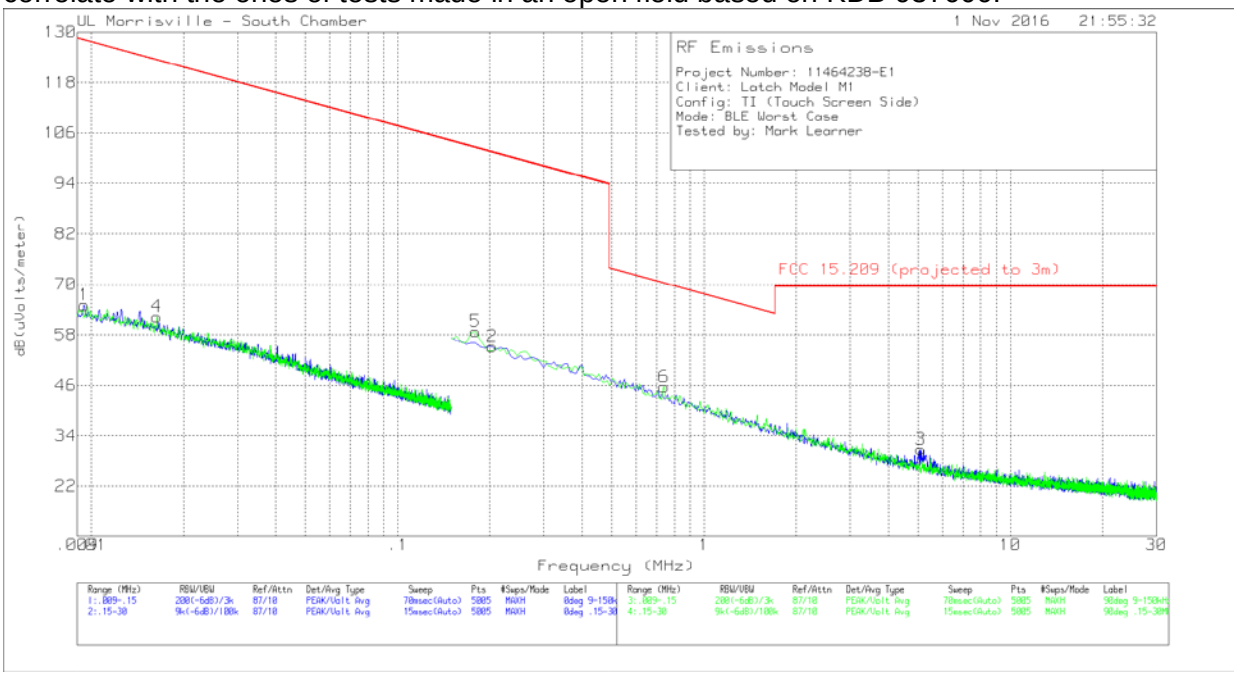
9.4. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 9KHz TO 30 MHz (WORST-CASE CONFIGURATION)

Note: All measurements were made at a test distance of 3 m. The limits in the plots and tabular data are the FCC/IC limits extrapolated from the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to the measurement distance to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were 40*Log (specification distance / test distance).

Although these tests were performed at a test site other than an open area test site, adequate comparison measurements were confirmed against 30 m open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 (projected to 3m)	Margin (dB)	Azimuth (Degs)	Polarity
1	.00948	45.53	Pk	19.4	.1	65.03	128.07	-63.04	0-360	0°
2	.20369	43.2	Pk	11.9	.1	55.2	101.42	-46.22	0-360	0°
3	5.10095	19.07	Pk	11.3	.4	30.77	69.54	-38.77	0-360	0°
4	.01639	45.8	Pk	16.4	.1	62.3	123.31	-61.01	0-360	90°
5	.17983	46.81	Pk	11.9	.1	58.81	102.51	-43.7	0-360	90°
6	.74054	33.6	Pk	11.9	.1	45.6	70.21	-24.61	0-360	90°

Pk - Peak detector

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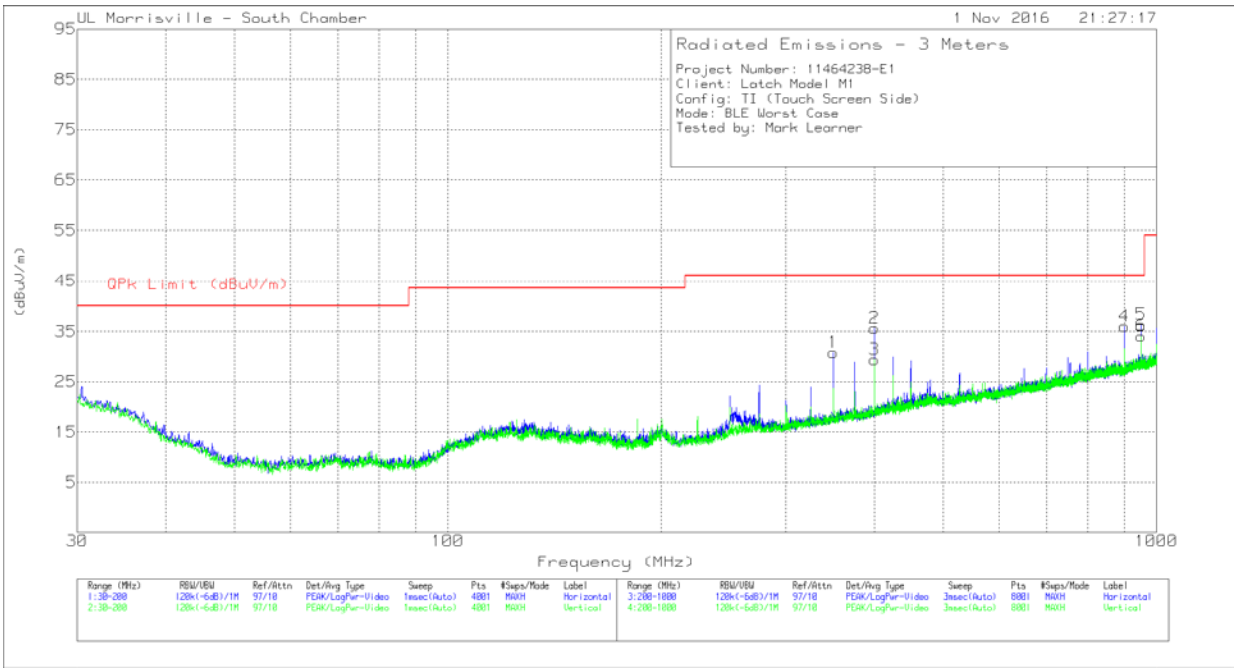
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 400	44.5	Pk	20.3	-29.2	35.6	46.02	-10.42	0-360	198	H
3	* 400	38.28	Pk	20.3	-29.2	29.38	46.02	-16.64	0-360	201	V
1	350	40.88	Pk	19.2	-29.3	30.78	46.02	-15.24	0-360	101	H
4	900	36.54	Pk	26.6	-27.1	36.04	46.02	-9.98	0-360	198	H
5	950.1	35.22	Pk	27.5	-26.4	36.32	46.02	-9.7	0-360	198	H
6	950.1	32.97	Pk	27.5	-26.4	34.07	46.02	-11.95	0-360	201	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector

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