FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-247 ISSUE 2

BLUETOOTH LOW ENERGY
CERTIFICATION TEST REPORT

FOR

BLE FITNESS TRACKER

MODEL NUMBER: UBC01

FCC ID: SHI-UBC01
IC: 10833A-UBC01

REPORT NUMBER: R11752034-E1

ISSUE DATE: 2017-08-07

Prepared for
UNDER ARMOUR, INC.
1020 HULL ST, SUITE 300
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NVLAP TESTING

NVLAP LAB CODE 200246-0

Revision History

Ver.	Issue Date	Revisions	Revised By
1	2017-06-30	Initial Issue	Brian Kiewra
2	2017-08-07	Added "Note: Prescan taken at 1MHz/30kHz, follow-up measurements taken at 1MHz/3MHz" to 1-18GHz radiated scans.	Brian Kiewra

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ATTESTATION OF TEST RESULTS

COMPANY NAME:	Under Armour, Inc. 1020 Hull Street, Suite 300 Baltimore, MD 21230-5358 USA
EUT DESCRIPTION:	BLE Fitness Tracker
MODEL:	UBC01
SERIAL NUMBER:	BL3A
DATE TESTED:	2017-05-23 to 2017-05-30

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-247 Issue 2	Pass
INDUSTRY 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, or any agency of the U.S. Government.

Approved & Released
For UL LLC By:

Jeffrey Moser
EMC Program Manager
UL – Consumer Technology Division

Prepared By:

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EMC Engineer
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1. 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 2.

2. 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 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/.

3. CALIBRATION AND UNCERTAINTY

3.1. 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.

3.2. 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

3.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Occupied Channel Bandwidth	±2.00%
RF output power, conducted	±1.3 dB
Power Spectral Density, conducted	±2.47 dB
Unwanted Emissions, conducted	±2.94dB
All emissions, radiated	±5.36 dB
Temperature	$\pm 0.07^{0}$C
Supply voltages	±2.40%
Time	±3.39%

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

4. EQUIPMENT UNDER TEST

4.1. DESCRIPTION OF EUT

The EUT is a Bluetooth Low Energy transceiver.

4.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	BLE	4.72	2.96

4.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an antenna with a maximum gain of 0.8 dBi.

4.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was bootloader, rev. 1.5
The EUT driver software installed during testing was radio_configuration_patch, rev. 2.0
The test utility software used during testing was cm_test_ch0/19/39.emp, rev. 3.0

4.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions, below 1GHz and above 18GHz, and power line conducted emissions were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y, and Z. It was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

Based on the baseline scan, the worst-case data rates were:

BLE: 1 Mbps.

4.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	**Manufacturer**	**Model**	**Serial Number**
Mobile Phone	Samsung	SM-G900H	G900HGSMH

I/O CABLES

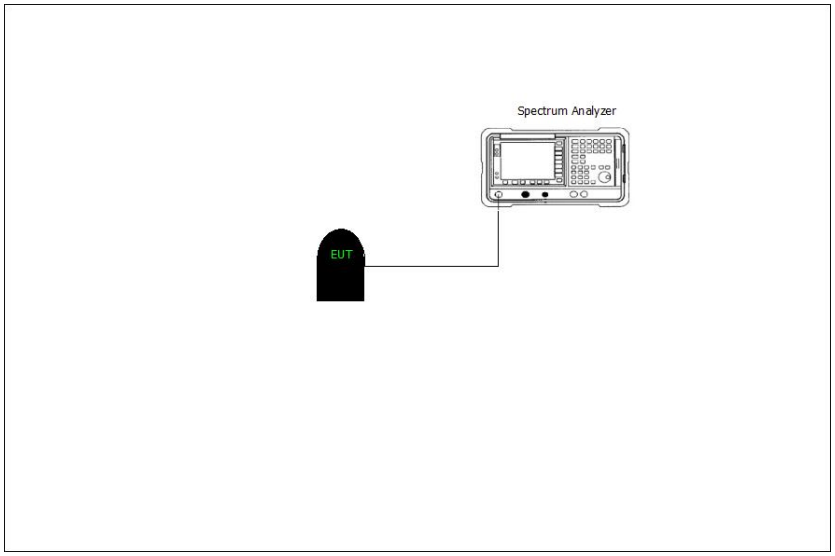
I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length m**	**Remarks**
None						

TEST SETUP

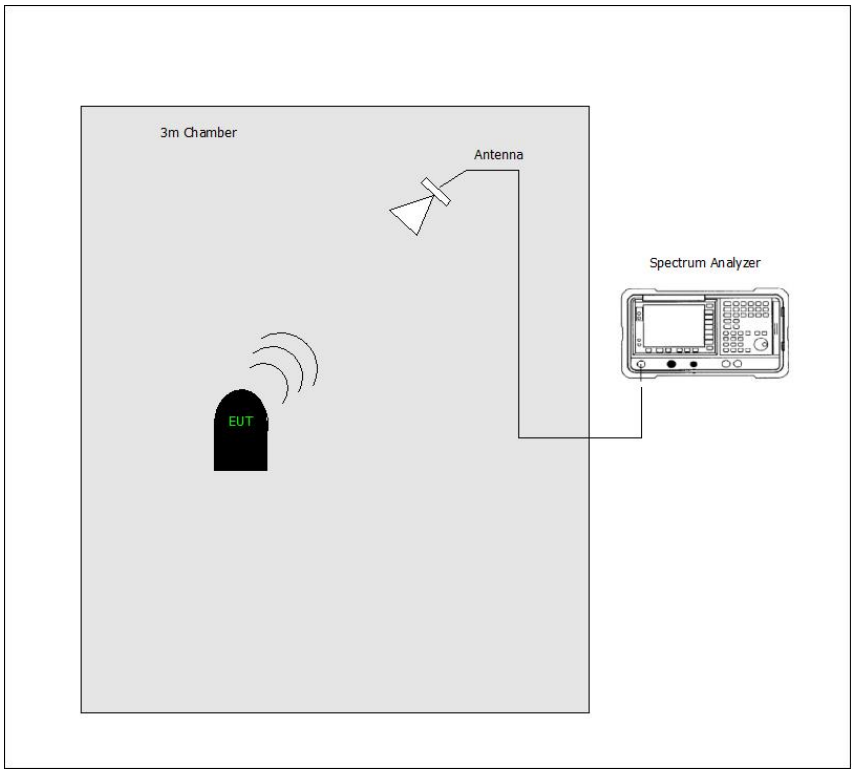
The EUT is installed as a standalone device

SETUP DIAGRAM FOR TESTS

Conducted Setup



Radiated Setup



5. 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 - North Chamber)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	0.009-30MHz	**(Loop Ant.)**			
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2016-12-28	2017-12-31
	18-40 GHz				
AT0076	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2016-09-06	2017-09-06
AT0077	Horn Antenna, 26-40GHz	ARA	MWH-2640/B	2016-09-06	2017-09-06
	Gain-Loss Chains				
N-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2016-10-04	2017-10-04
N-SAC04	Gain-loss string: 18-40GHz	Various	Various	2017-03-03	2018-03-03
	Receiver & Software				
SA0027	Spectrum Analyzer	Agilent	N9030A	2017-03-16	2018-03-16
SA0026 (18-40GHz RSE)	Spectrum Analyzer	Agilent	N9030A	2017-02-17	2018-02-28
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Additional Equipment used				
s/n 161024690	Environmental Meter	Fisher Scientific	15-077-963	2016-12-21	2018-12-21

Radiated Disturbance Emissions Test Equipment (Morrisville - South Chamber)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	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	2017-04-05	2018-04-05
	Gain-Loss Chains				
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
	Receiver & Software				
SA0025	Spectrum Analyzer	Agilent	N9030A	2017-04-10	2018-04-10
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Additional Equipment used				
s/n 161024887	Environmental Meter	Fisher Scientific	15-077-963	2016-12-23	2018-12-23

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Common Equipment				
	Conducted Room 2				
SA0020	Spectrum Analyzer	Agilent Technologies	E4446A	2017-04-25	2018-04-25
PWM003	RF Power Meter	Keysight Technologies	N1911A	2016-06-21	2017-06-21
PWS004	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2016-06-22	2017-06-22
15557603	Temp/Humidity Sensor	Fisher Scientific	14-650-118	2016-11-02	2018-11-02
76021	DC Regulated Power Supply	CircuitSpecialists.Com	CSI3005X5	N/A	N/A

6. MEASUREMENT METHODS

On Time and Duty Cycle: KDB 558074 D01 v04, Section 6.0

6 dB BW: KDB 558074 D01 v04, Section 8.1.

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

Output Power: KDB 558074 D01 v04, Section 9.1.3.

Power Spectral Density: KDB 558074 D01 v04, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v04, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v04, Section 12.1.

7. ANTENNA PORT TEST RESULTS

7.1. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

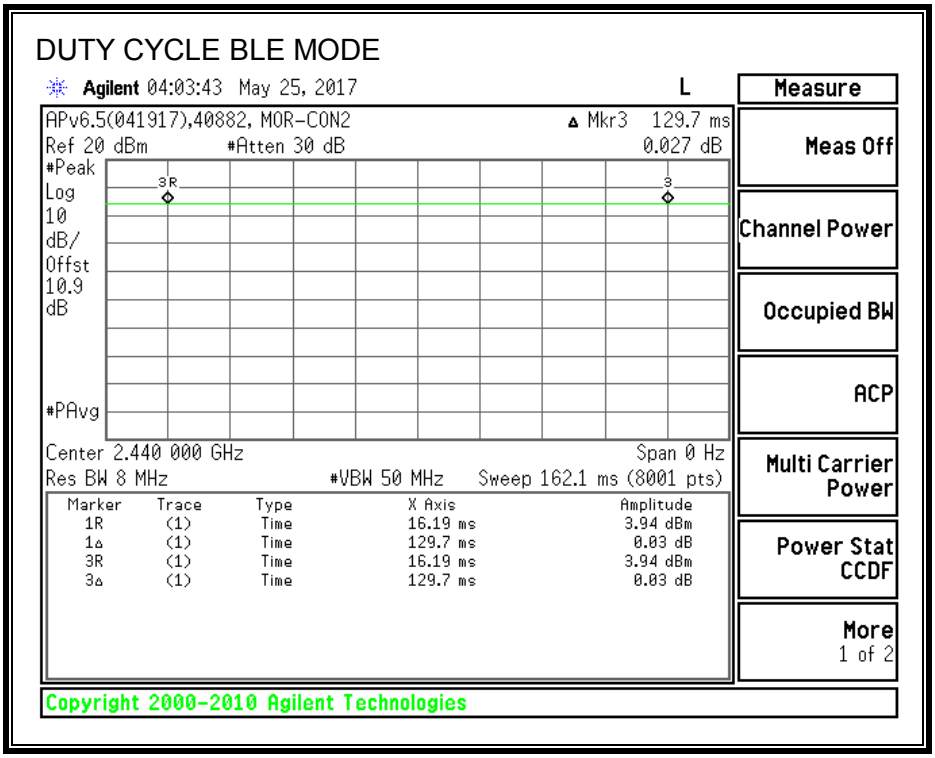
PROCEDURE

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	1.000	1.000	1.000	100.00%	0.00	0.010

DUTY CYCLE PLOTS



Test Information

Date: 2017-05-25

Tester: Jeff Cabrera

7.2. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)
IC RSS-247 5.2 (a)

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

Test Information

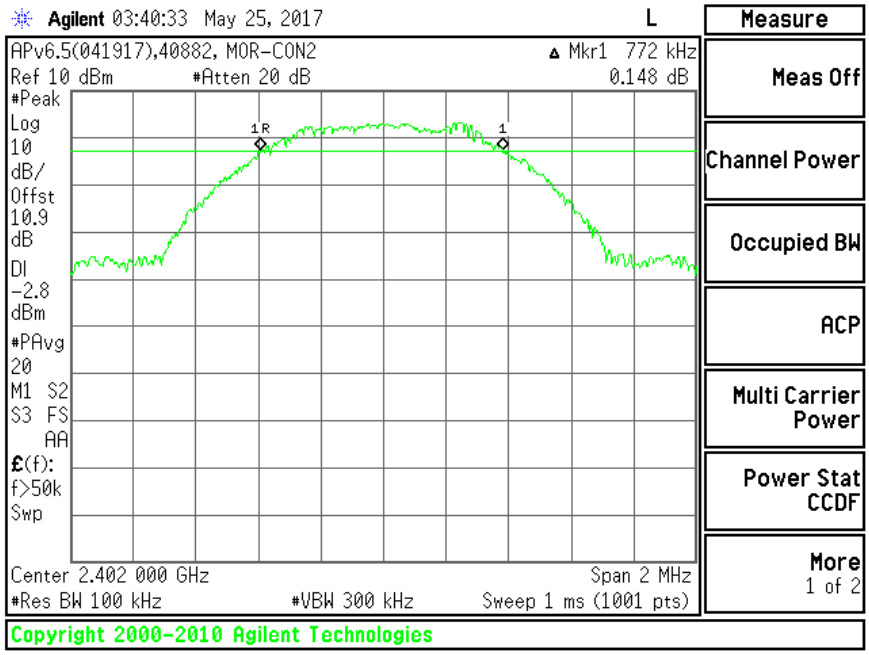
Date: 2017-05-25
Tester: Jeff Cabrera

RESULTS

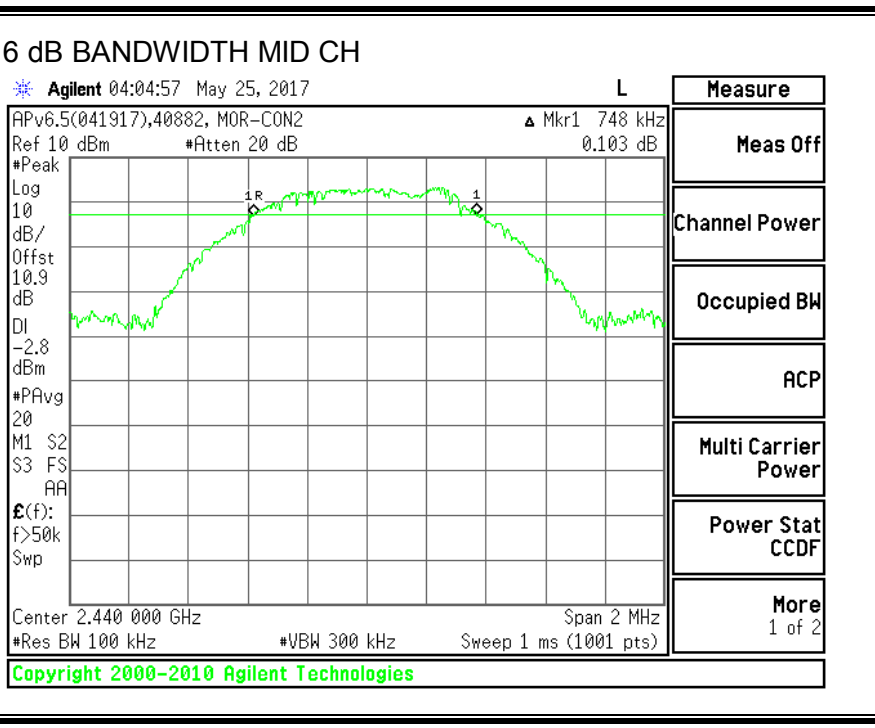
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.7720	0.5
Middle	2440	0.7480	0.5
High	2480	0.7480	0.5

6 dB BANDWIDTH

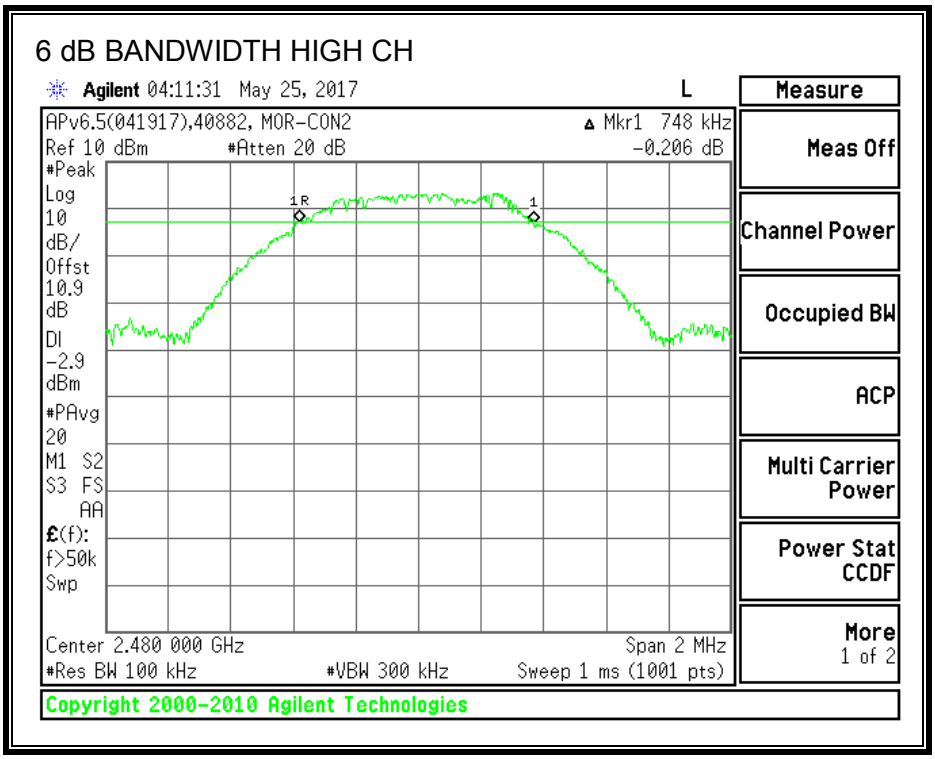
6 dB BANDWIDTH LOW CH



6 dB BANDWIDTH MID CH



6 dB BANDWIDTH HIGH CH



7.3. 99% BANDWIDTH

LIMITS

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

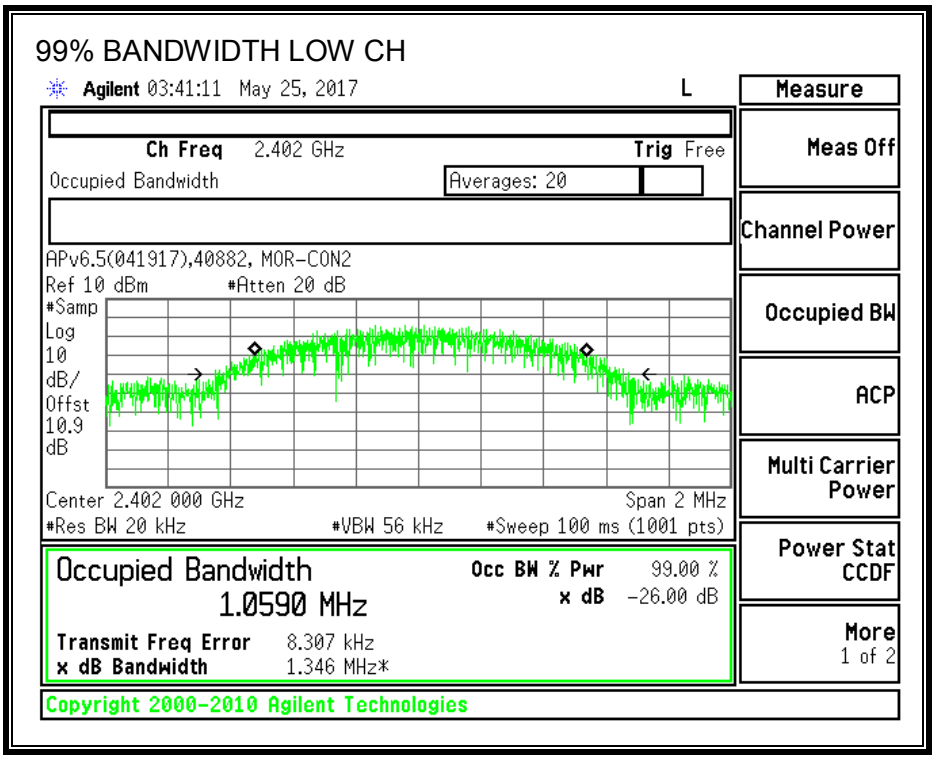
TEST PROCEDURE

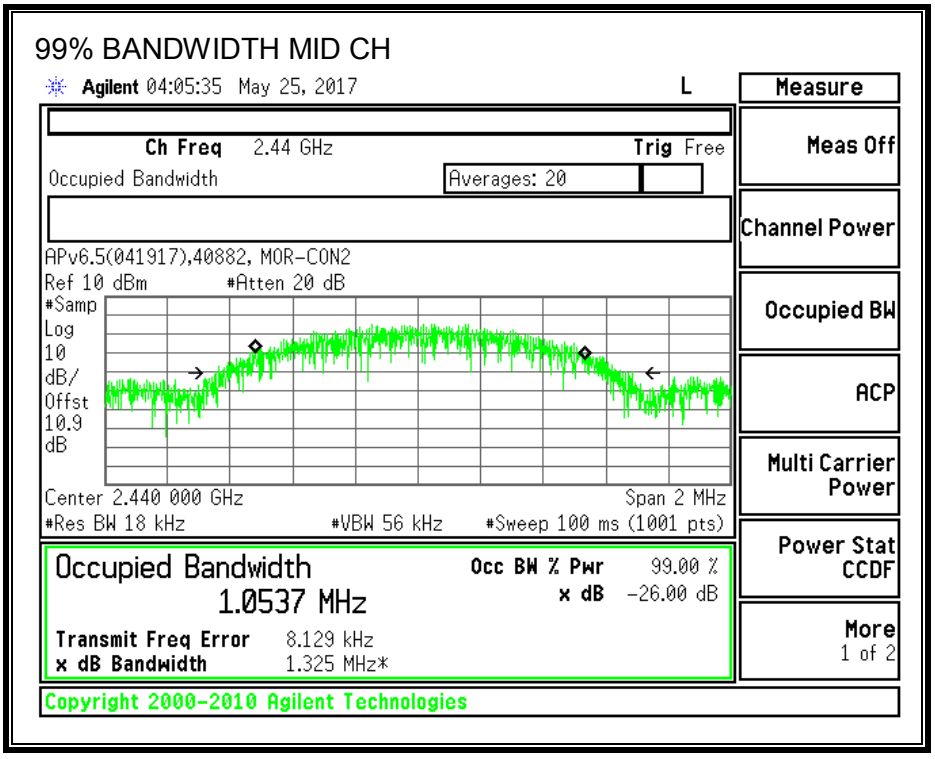
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 5% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

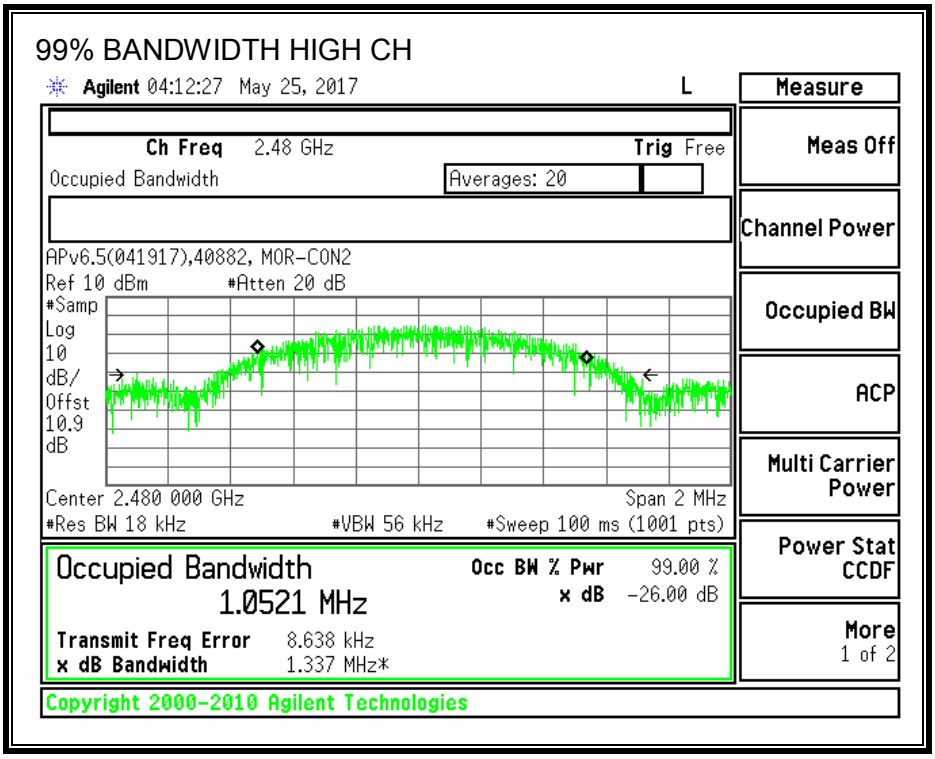
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0590
Middle	2440	1.0537
High	2480	1.0521

99% BANDWIDTH







Test Information

Date: 2017-05-25

Tester: Jeff Cabrera

7.4. OUTPUT POWER

LIMITS

FCC §15.247 (b)
IC RSS-247 5.4

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

TEST PROCEDURE

The transmitter output was connected to a power meter equipped with a power sensor capable of measuring peak power. The cable assembly insertion loss of 10.86 dB (including 10 dB pad and 0.86 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.72	30	-25.280
Middle	2440	3.83	30	-26.170
High	2480	4.72	30	-25.280

Test Information
Date: 2017-06-30
Tester: Jeff Cabrera

7.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

The cable assembly insertion loss of 10.86 dB (including 10 dB pad and 0.86 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	2402	3.17
Middle	2440	3.01
High	2480	2.74

TEST INFORMATION

Date:2017-06-30
Project No: 11752034
Tester: Jeffrey Cabrera

7.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)
IC RSS-247 5.2 (b)

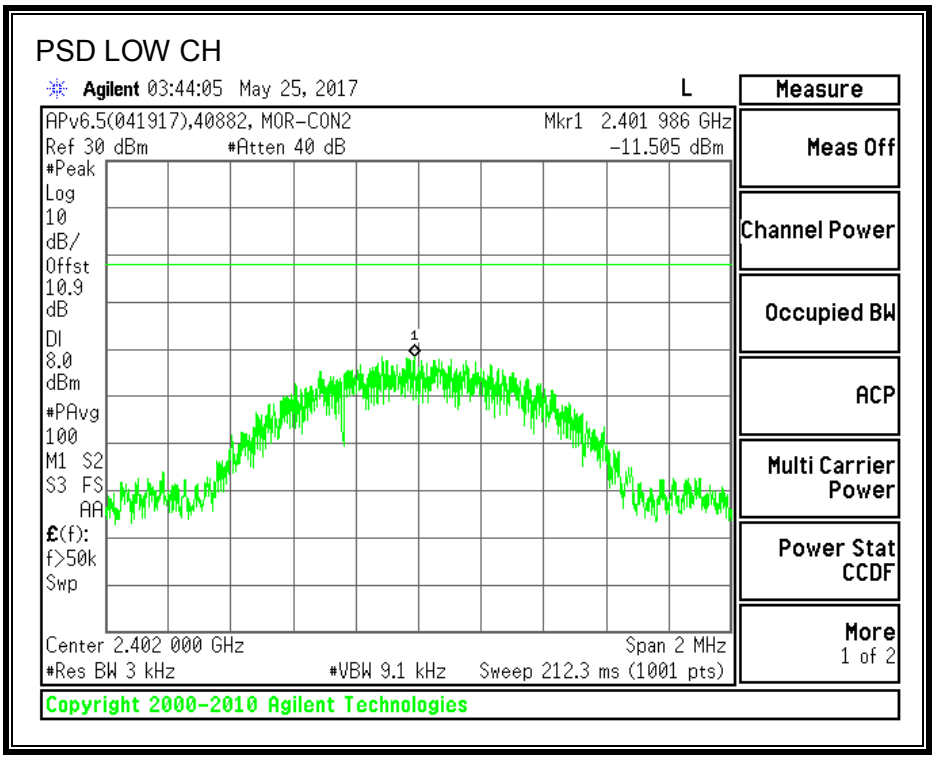
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

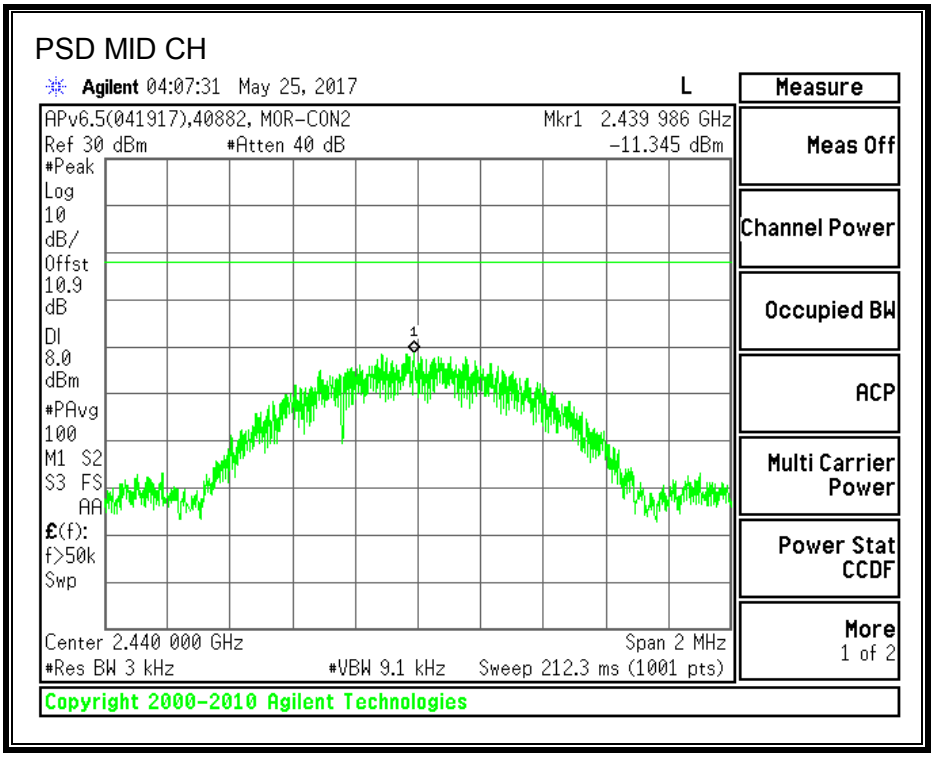
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-11.51	8	-19.51
Middle	2440	-11.35	8	-19.35
High	2480	-11.33	8	-19.33

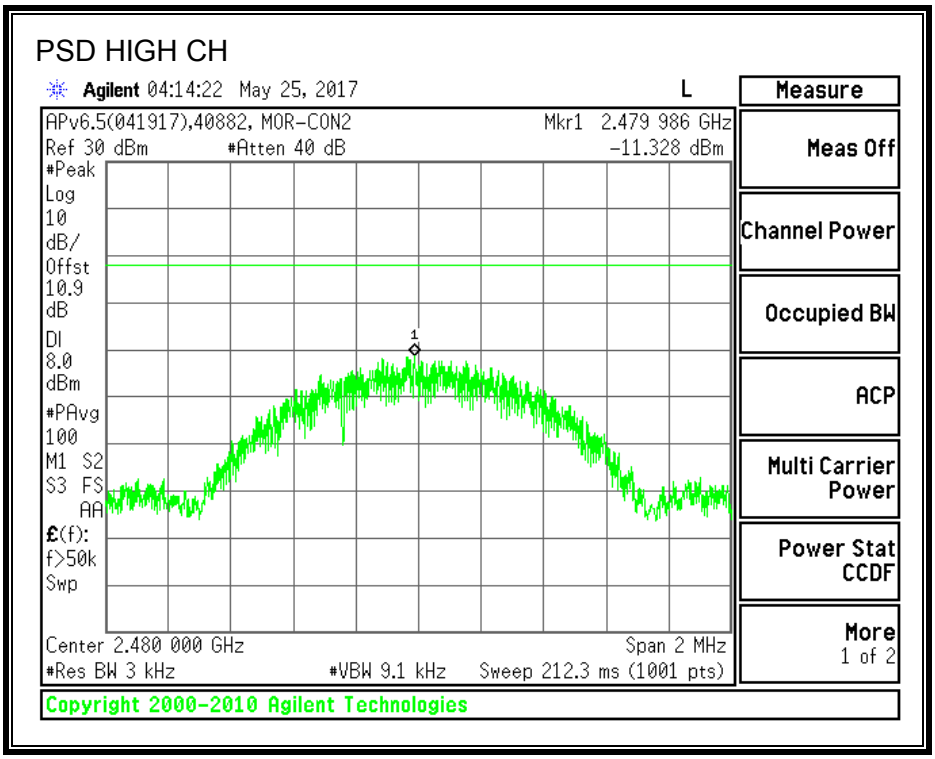
POWER SPECTRAL DENSITY

PSD LOW CH



PSD MID CH





Test Information

Date: 2017-05-25

Tester: Jeff Cabrera

7.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

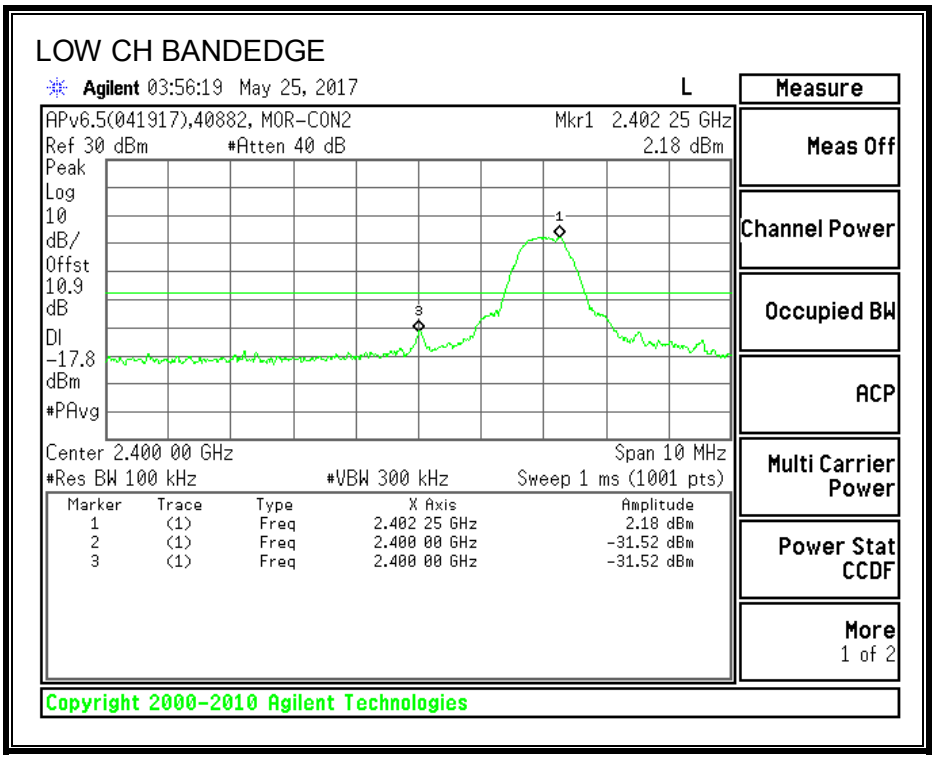
FCC §15.247 (d)

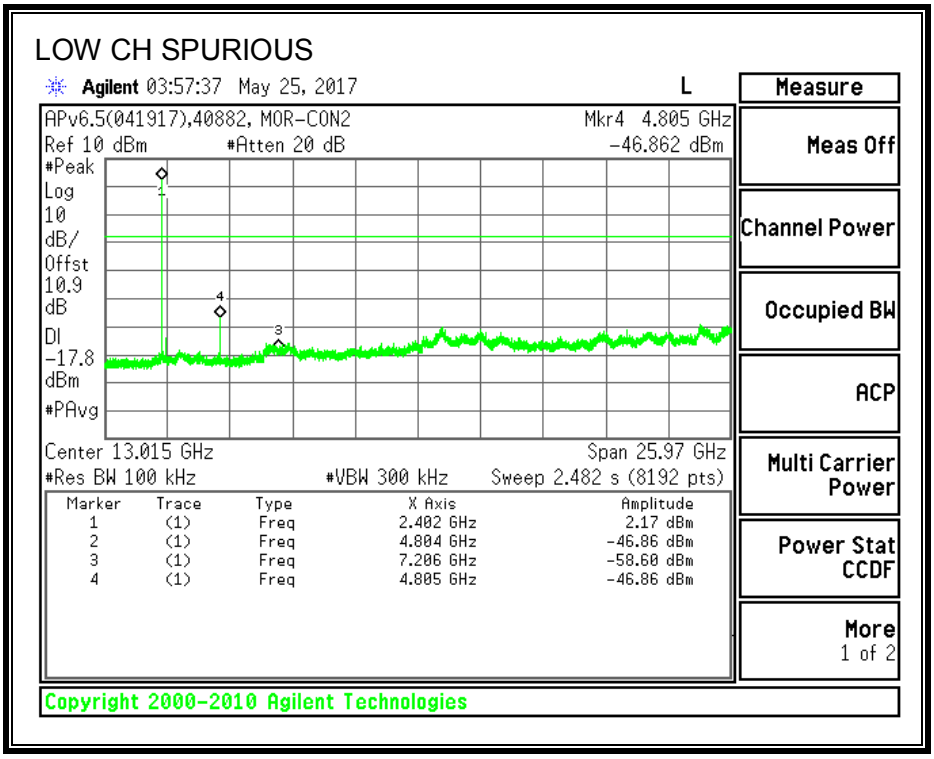
IC RSS-247 5.5

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

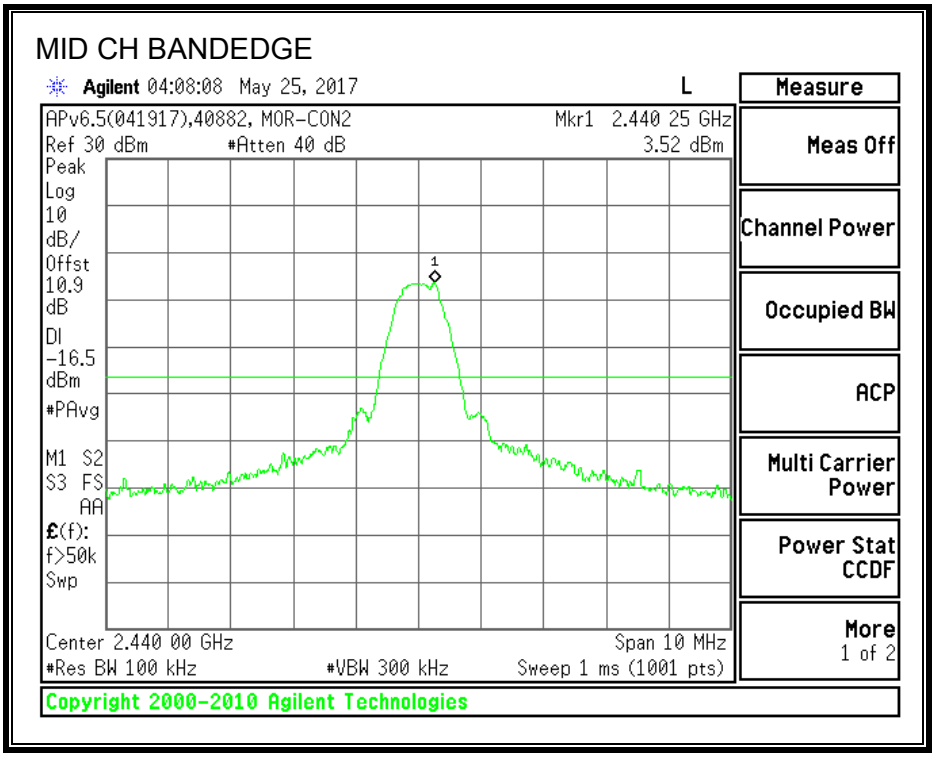
RESULTS

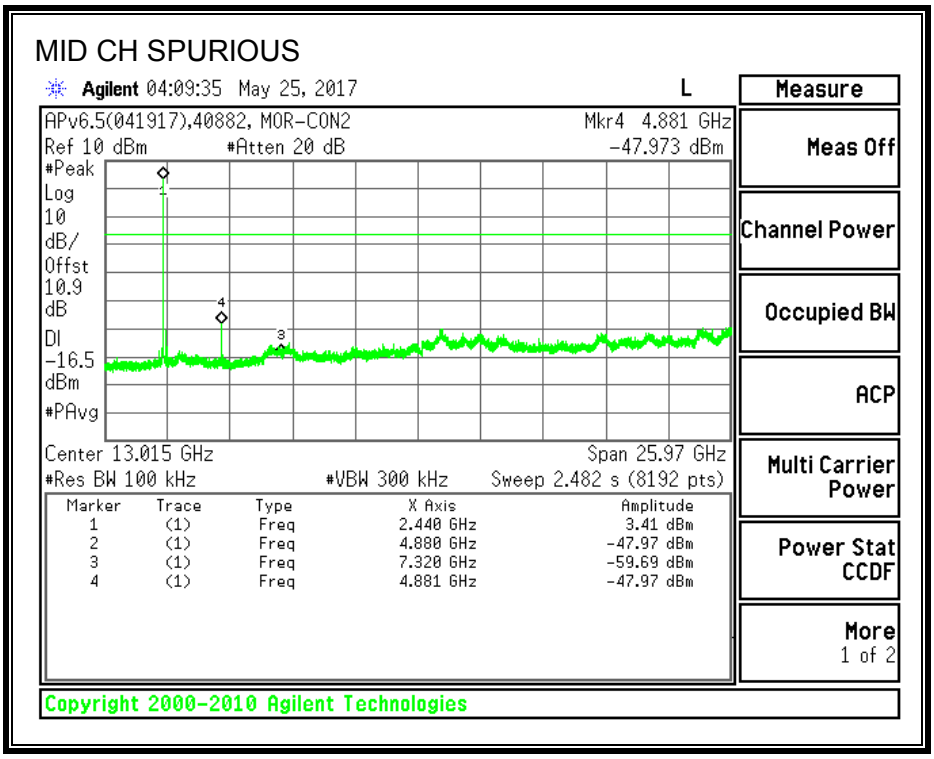
SPURIOUS EMISSIONS, LOW CHANNEL



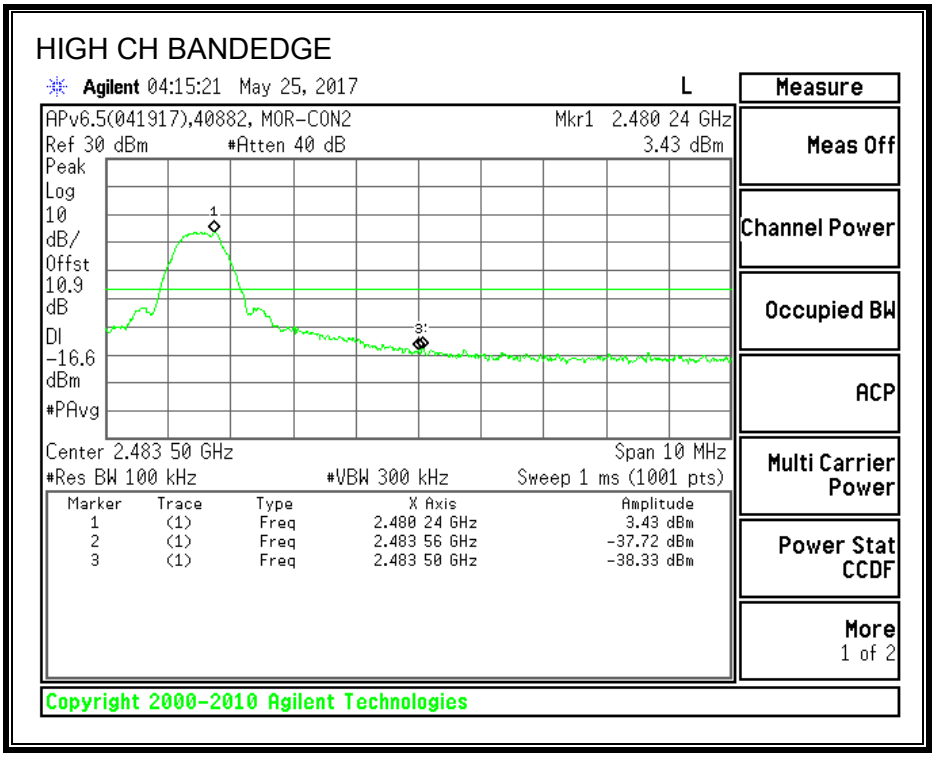


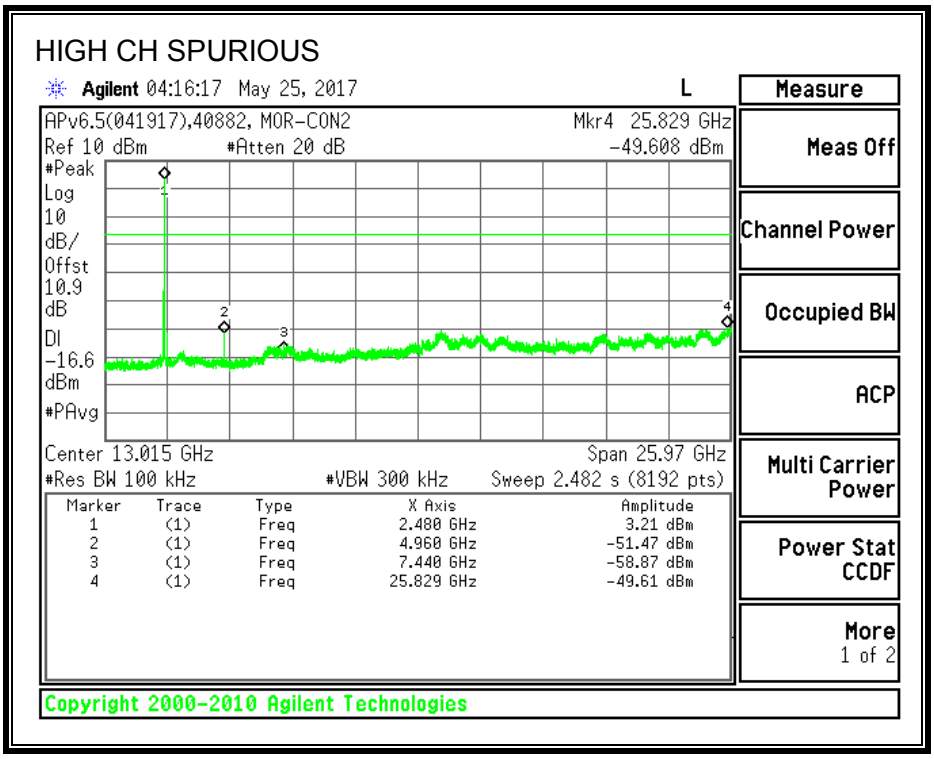
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





Test Information

Date: 2017-05-25

Tester: Jeff Cabrera

8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209
IC RSS-GEN Clause 8.9 (Transmitter)
IC RSS-GEN Clause 7.1.2 (Receiver)

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.

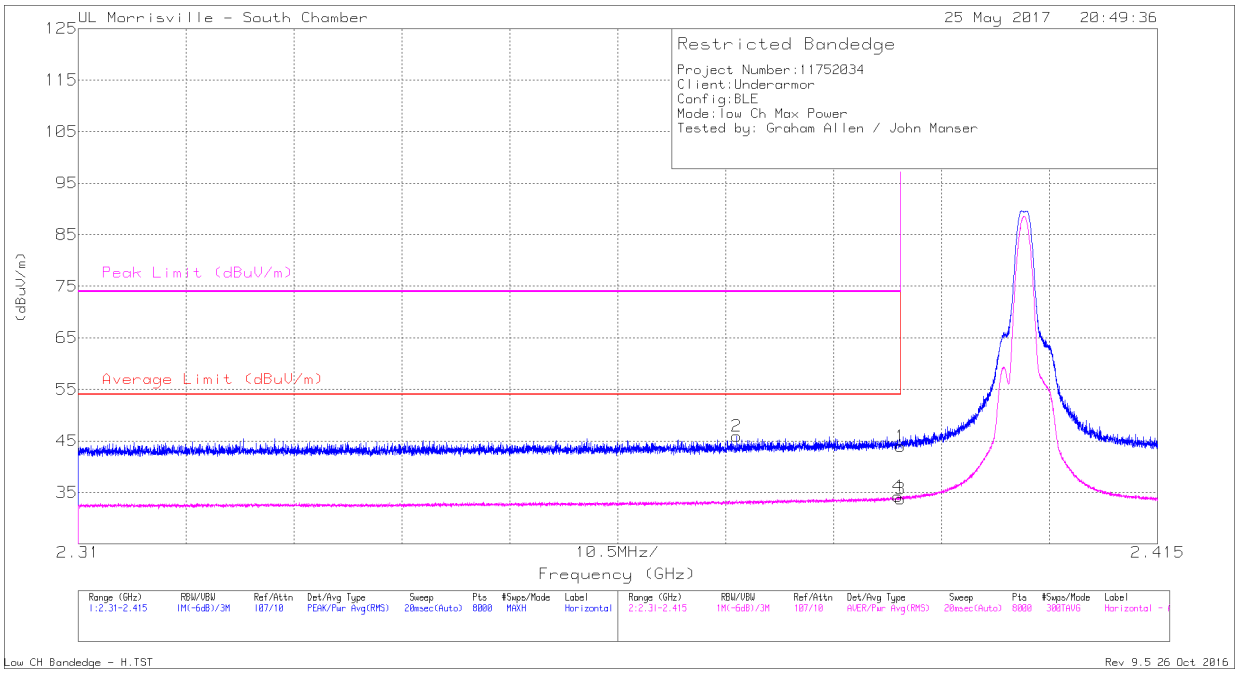
For peak measurements above 1 GHz, the resolution bandwidth is set to 1 MHz and the video bandwidth is set to 3 MHz. For average measurements above 1GHz, the resolution bandwidth and video bandwidth are set as described in ANSI C63.10:2013 for the applicable measurement. The particular averaging method used for this test program was RMS averaging.

The spectrum from 1 to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. For 9kHz - 1GHz and 18-26GHz, worst-case channel was measured.

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.

8.2. TRANSMITTER ABOVE 1 GHz

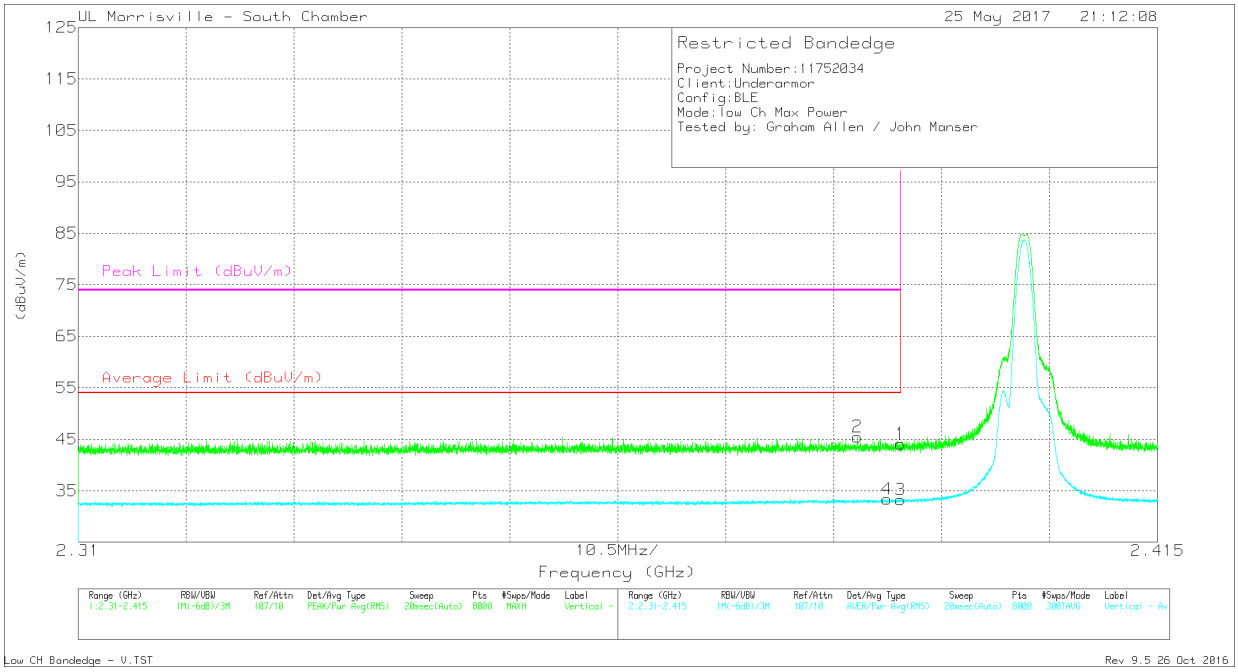
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/ Fltr/Pad (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	36.17	Pk	31.9	-24.1	43.97	-	-	74	-30.03	45	121	H
2	* 2.374	38.14	Pk	31.8	-24	45.94	-	-	74	-28.06	45	121	H
3	* 2.39	25.93	RMS	31.9	-24.1	33.73	54	-20.27	-	-	45	121	H
4	* 2.39	26.43	RMS	31.9	-24.1	34.23	54	-19.77	-	-	45	121	H

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

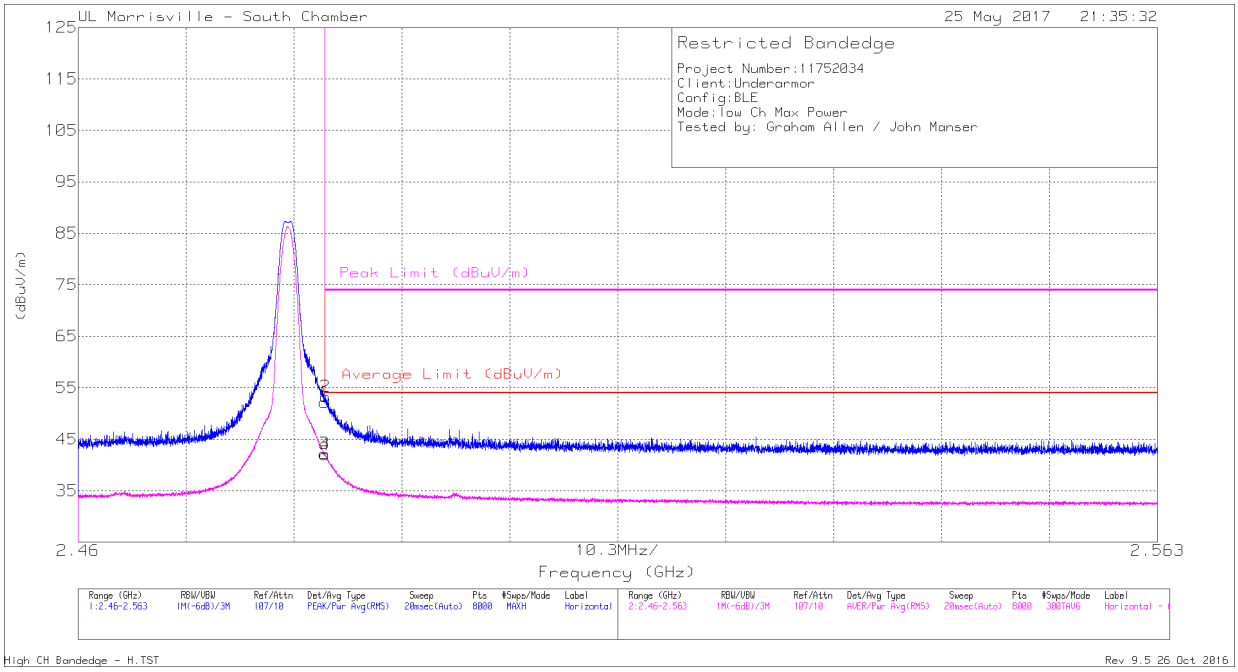
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl /Fltr/Pad (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	36.31	Pk	31.9	-24.1	44.11	-	-	74	-29.89	318	117	V
2	* 2.386	37.58	Pk	31.9	-24	45.48	-	-	74	-28.52	318	117	V
3	* 2.39	25.43	RMS	31.9	-24.1	33.23	54	-20.77	-	-	318	117	V
4	* 2.389	25.58	RMS	31.9	-24.1	33.38	54	-20.62	-	-	318	117	V

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

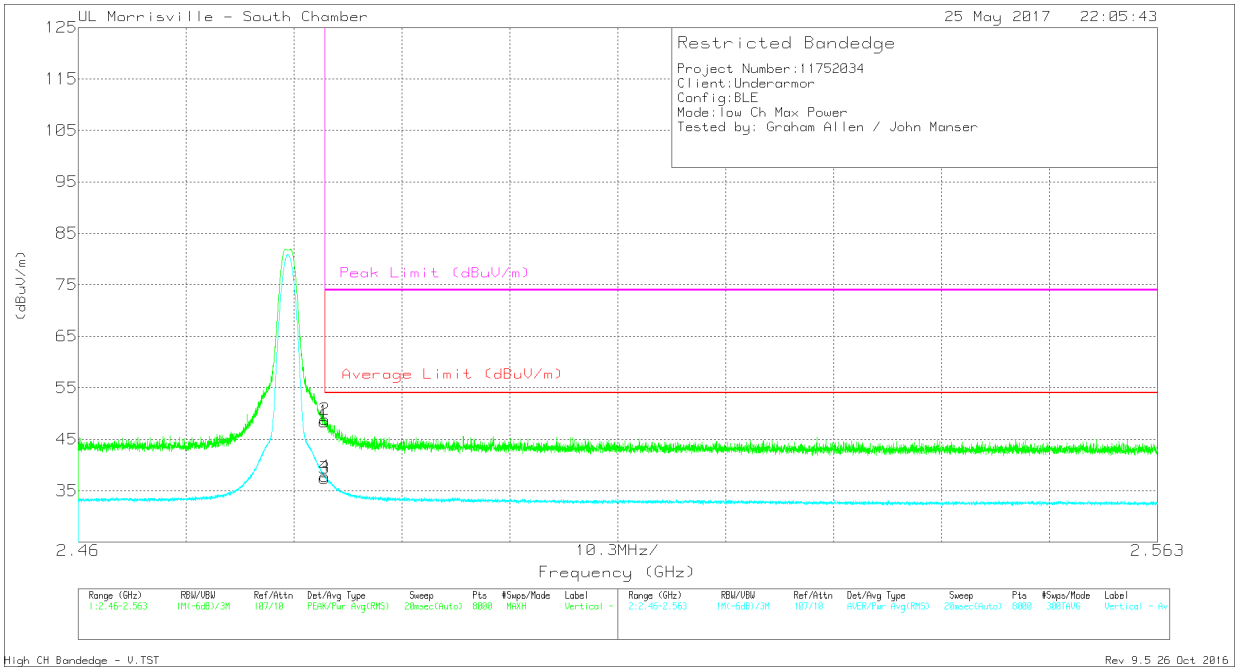
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/ Fltr/Pad (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	44.35	Pk	32.4	-24.6	52.15	-	-	74	-21.85	32	126	H
2	* 2.484	45.46	Pk	32.4	-24.6	53.26	-	-	74	-20.74	32	126	H
3	* 2.484	34.4	RMS	32.4	-24.6	42.2	54	-11.8	-	-	32	126	H
4	* 2.484	34.16	RMS	32.4	-24.6	41.96	54	-12.04	-	-	32	126	H

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

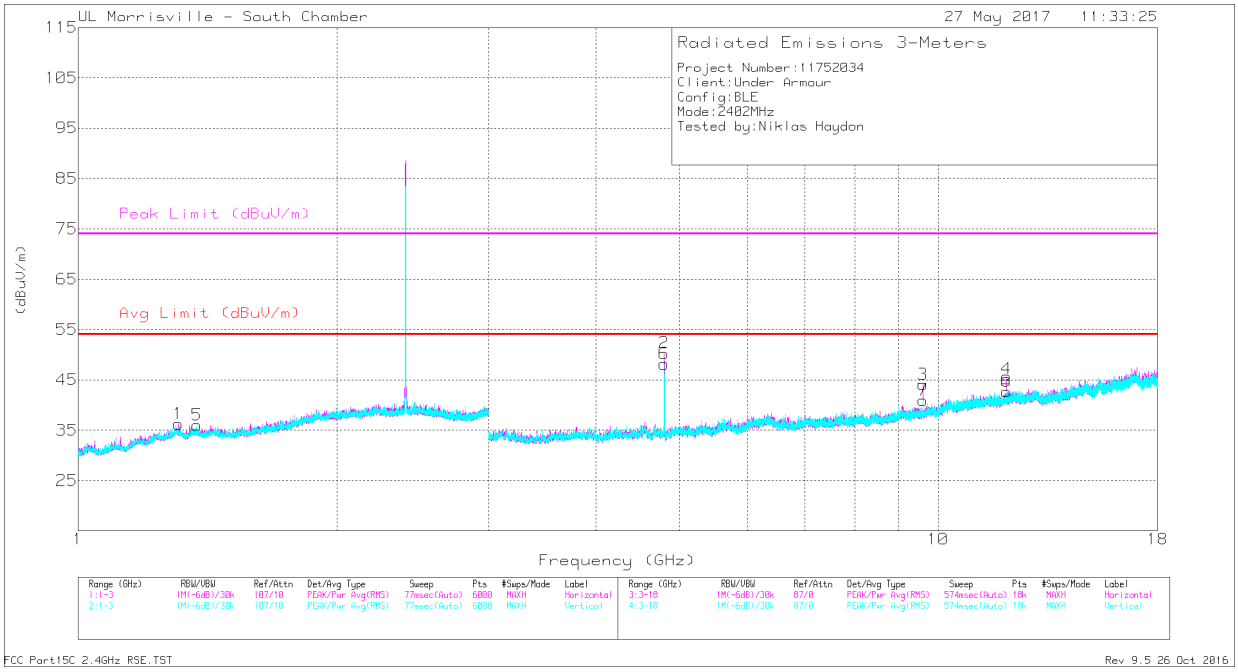
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/ Fltr/Pad (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	40.62	Pk	32.4	-24.6	48.42	-	-	74	-25.58	306	104	V
2	* 2.484	41.05	Pk	32.4	-24.6	48.85	-	-	74	-25.15	306	104	V
3	* 2.484	29.6	RMS	32.4	-24.6	37.4	54	-16.6	-	-	306	104	V
4	* 2.484	30.02	RMS	32.4	-24.6	37.82	54	-16.18	-	-	306	104	V

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

HARMONICS AND SPURIOUS EMISSIONS 1 to 18 GHz (LOW CHANNEL)

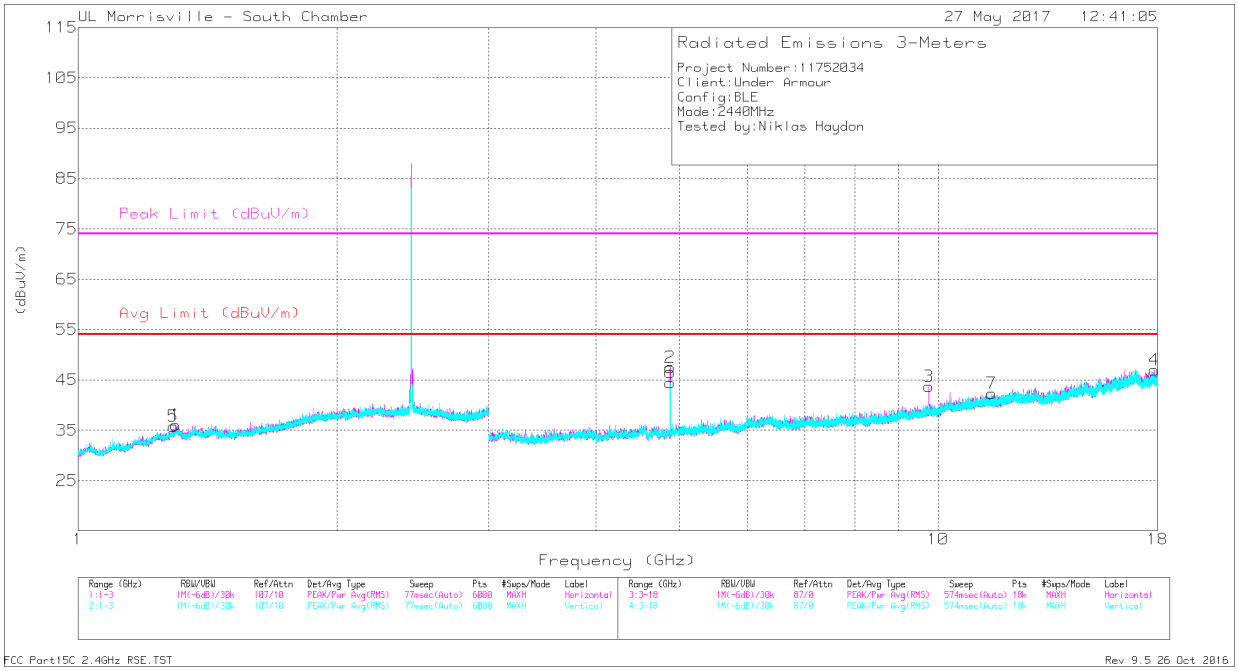


Note: Prescan taken at 1MHz/30kHz, follow-up measurements taken at 1MHz/3MHz.

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.307	35.53	PK2	29.1	-23.1	41.53	-	-	74	-32.47	25	206	H
	* 1.307	23.81	MAv1	29.1	-23.1	29.81	54	-24.19	-	-	25	206	H
2	* 4.803	50.9	PK2	34	-31.1	53.8	-	-	74	-20.2	35	279	H
	* 4.804	45.79	MAv1	34	-31.1	48.69	54	-5.31	-	-	35	279	H
4	* 12.009	37.1	PK2	38.7	-24.3	51.5	-	-	74	-22.5	149	107	H
	* 12.009	27.27	MAv1	38.7	-24.3	41.67	54	-12.33	-	-	149	107	H
5	* 1.375	35.28	PK2	28.9	-23	41.18	-	-	74	-32.82	354	390	V
	* 1.375	23.59	MAv1	28.9	-23	29.49	54	-24.51	-	-	354	390	V
6	* 4.804	47.79	PK2	34	-31.1	50.69	-	-	74	-23.31	253	108	V
	* 4.804	42.4	MAv1	34	-31.1	45.3	54	-8.7	-	-	253	108	V
8	* 12.009	35.75	PK2	38.7	-24.3	50.15	-	-	74	-23.85	8	390	V
	* 12.009	25.4	MAv1	38.7	-24.3	39.8	54	-14.2	-	-	8	390	V
7	9.606	30.59	Pk	36.7	-26.3	40.99	-	-	-	-	0-360	199	V
3	9.609	33.7	Pk	36.7	-26.3	44.1	-	-	-	-	0-360	102	H

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

HARMONICS AND SPURIOUS EMISSIONS 1 to 18 GHz (MID CHANNEL)

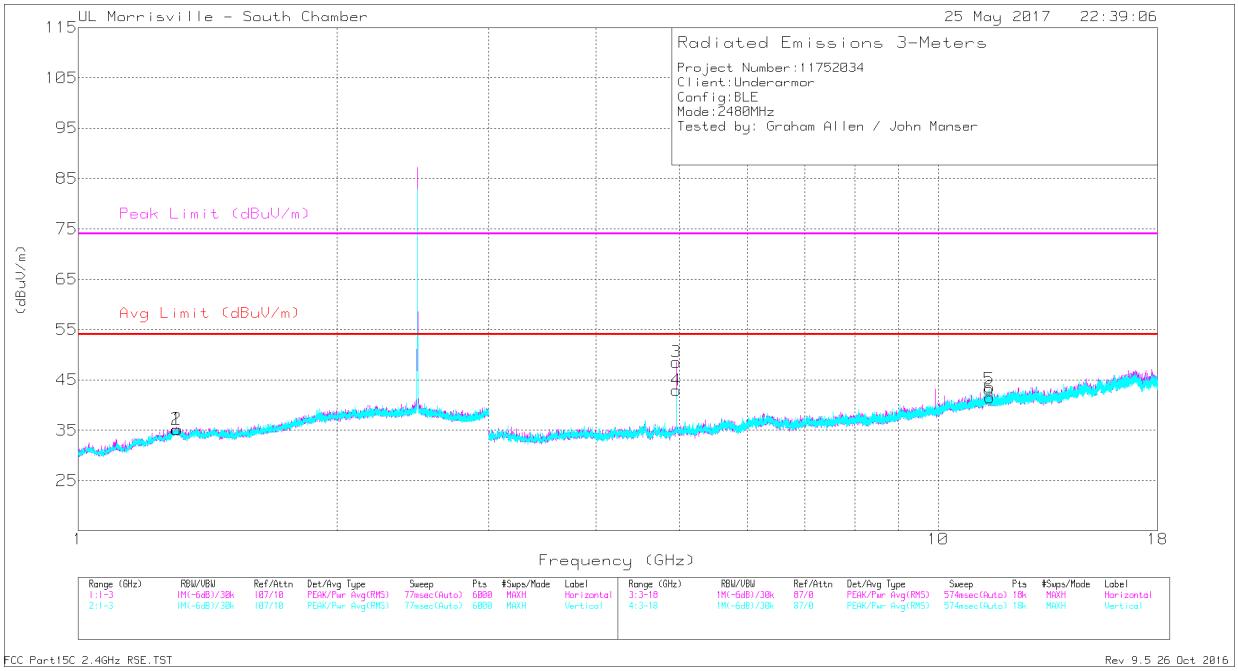


Note: Prescan taken at 1MHz/30kHz, follow-up measurements taken at 1MHz/3MHz.

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.298	35.76	PK2	29.2	-23.2	41.76	-	-	74	-32.24	297	251	H
	* 1.298	23.99	MAv1	29.2	-23.2	29.99	54	-24.01	-	-	297	251	H
2	* 4.879	48.61	PK2	34	-31	51.61	-	-	74	-22.39	30	102	H
	* 4.88	42.78	MAv1	34	-31	45.78	54	-8.22	-	-	30	102	H
4	* 17.854	34.64	PK2	40.8	-22.2	53.24	-	-	74	-20.76	293	246	H
	* 17.854	22.09	MAv1	40.8	-22.2	40.69	54	-13.31	-	-	293	246	H
5	* 1.29	35.4	PK2	29.1	-23.2	41.3	-	-	74	-32.7	275	108	V
	* 1.29	23.78	MAv1	29.1	-23.2	29.68	54	-24.32	-	-	275	108	V
6	* 4.88	46.12	PK2	34	-31	49.12	-	-	74	-24.88	258	105	V
	* 4.88	39.36	MAv1	34	-31	42.36	54	-11.64	-	-	258	105	V
7	* 11.549	35.07	PK2	38.3	-24.7	48.67	-	-	74	-25.33	200	275	V
	* 11.551	22.76	MAv1	38.3	-24.7	36.36	54	-17.64	-	-	200	275	V
3	9.759	32.83	Pk	36.8	-25.9	43.73	-	-	-	-	0-360	102	H

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

HARMONICS AND SPURIOUS EMISSIONS 1 to 18 GHz (HIGH CHANNEL)

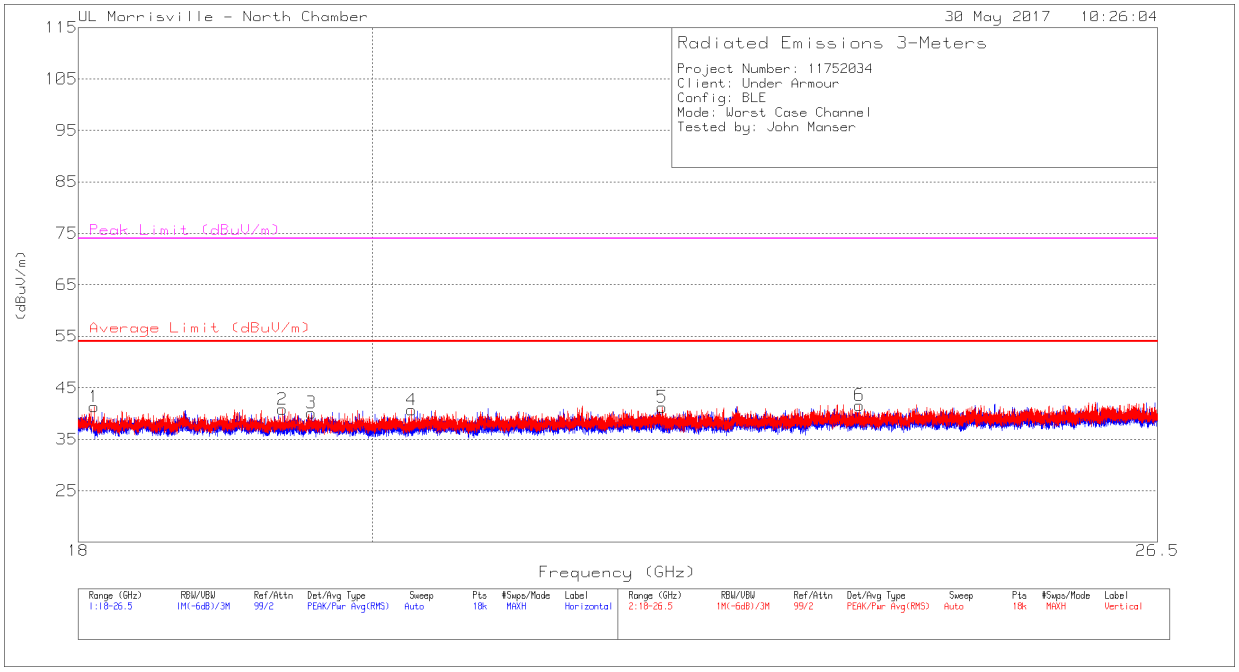


Note: Prescan taken at 1MHz/30kHz, follow-up measurements taken at 1MHz/3MHz.

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.302	35.86	PK2	29.2	-23.1	41.96	-	-	74	-32.04	91	168	H
	* 1.302	23.9	MAv1	29.2	-23.1	30	54	-24	-	-	91	168	H
3	* 4.96	49.81	PK2	34	-31.3	52.51	-	-	74	-21.49	49	133	H
	* 4.96	43.94	MAv1	34	-31.3	46.64	54	-7.36	-	-	49	133	H
6	* 11.484	34.31	PK2	38.3	-24.7	47.91	-	-	74	-26.09	206	352	H
	* 11.487	23	MAv1	38.3	-24.7	36.6	54	-17.4	-	-	206	352	H
2	* 1.3	36.12	PK2	29.2	-23.2	42.12	-	-	74	-31.88	82	321	V
	* 1.3	23.95	MAv1	29.2	-23.2	29.95	54	-24.05	-	-	82	321	V
4	* 4.96	44.91	PK2	34	-31.3	47.61	-	-	74	-26.39	23	106	V
	* 4.96	36.24	MAv1	34	-31.3	38.94	54	-15.06	-	-	23	106	V
5	* 11.472	34.43	PK2	38.2	-24.6	48.03	-	-	74	-25.97	267	382	V
	* 11.47	22.85	MAv1	38.2	-24.6	36.45	54	-17.55	-	-	267	382	V

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

HARMONICS AND SPURIOUS EMISSIONS 18 to 26 GHz (WORST CASE CONFIGURATION)

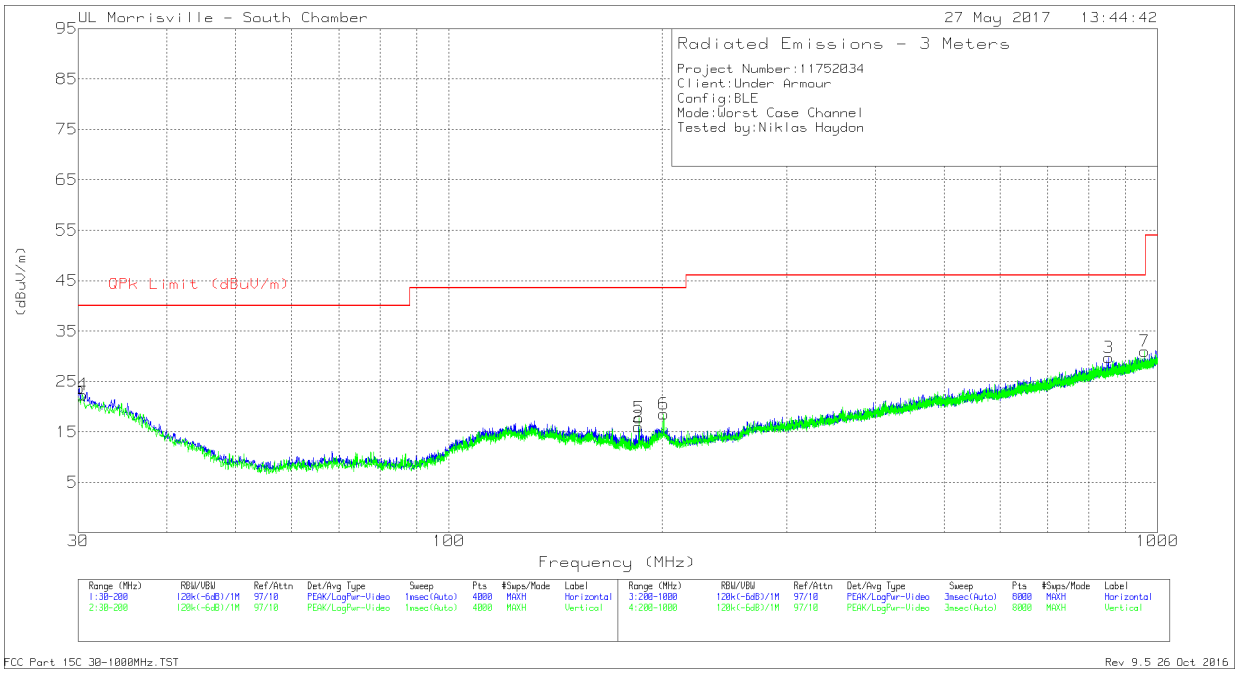


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0076 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 19.566	50.15	PK2	32.8	-41.2	41.75	-	-	74	-32.25	263	384	H
	* 19.566	37.29	MAv1	32.8	-41.2	28.89	54	-25.11	-	-	263	384	H
1	* 18.101	49.08	PK2	32.7	-40.9	40.88	-	-	74	-33.12	92	206	V
	* 18.101	36.86	MAv1	32.7	-40.9	28.66	54	-25.34	-	-	92	206	V
2	* 19.365	48.77	PK2	32.9	-41.1	40.57	-	-	74	-33.43	209	191	V
	* 19.365	36.72	MAv1	32.9	-41.1	28.52	54	-25.48	-	-	209	191	V
4	* 20.286	48.98	PK2	33.1	-41.4	40.68	-	-	74	-33.32	88	134	V
	* 20.286	36.68	MAv1	33.1	-41.4	28.38	54	-25.62	-	-	88	134	V
5	* 22.189	49.01	PK2	33.3	-41	41.31	-	-	74	-32.69	195	225	V
	* 22.189	36.97	MAv1	33.3	-41	29.27	54	-24.73	-	-	195	225	V
6	* 23.812	48.66	PK2	34	-40.5	42.16	-	-	74	-31.84	37	285	V
	* 23.813	36.33	MAv1	34	-40.5	29.83	54	-24.17	-	-	37	285	V

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

8.3. WORST-CASE BELOW 1 GHz

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



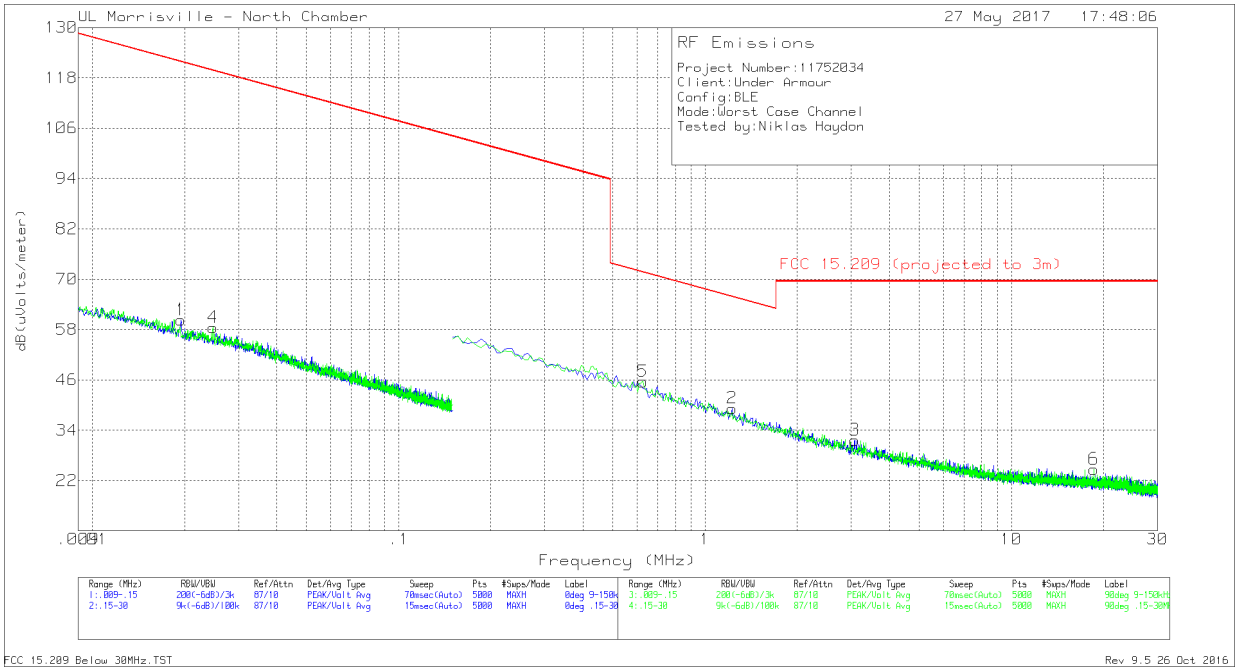
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.085	29.63	Pk	25.9	-31.8	23.73	40	-16.27	0-360	198	H
4	30.4251	28.45	Pk	25.7	-31.8	22.35	40	-17.65	0-360	101	V
2	185.0376	30.75	Pk	15.6	-30.3	16.05	43.52	-27.47	0-360	101	H
5	185.5903	32.36	Pk	15.7	-30.3	17.76	43.52	-25.76	0-360	101	V
6	201.0001	31.55	Pk	17.2	-30.2	18.55	43.52	-24.97	0-360	102	V
3	852.4848	30.82	Pk	26.4	-27.5	29.72	46.02	-16.3	0-360	102	H
7	958.2986	29.91	Pk	27.5	-26.4	31.01	46.02	-15.01	0-360	298	V

Pk - Peak detector

SPURIOUS EMISSIONS 9 kHz 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 an 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)
1	.01947	46.01	Pk	14.2	.1	60.31	121.82	-61.51	0-360
4	.02474	44.61	Pk	13.8	.1	58.51	119.74	-61.23	0-360
5	.62768	34.68	Pk	10.8	.1	45.58	71.65	-26.07	0-360
2	1.22478	28.04	Pk	11	.2	39.24	65.84	-26.6	0-360
3	3.08176	20.28	Pk	11.1	.3	31.68	69.54	-37.86	0-360
6	18.55859	14.05	Pk	10	.7	24.75	69.54	-44.79	0-360

Pk - Peak detector

Ambient Scan 9 kHz TO 30 MHz