



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

**BLUETOOTH LOW ENERGY
CERTIFICATION TEST REPORT**

FOR

WIRELESS HEADSET

MODEL NUMBER: 424411

**FCC ID: A94424411
IC: 3232A-424411**

REPORT NUMBER: R12161950-E2

ISSUE DATE: 2018-04-03

**Prepared for
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Revision History

Ver.	Issue Date	Revisions	Revised By
1	2018-03-02	Initial Issue	Brian T. Kiewra
2	2018-03-20	Revised EUT Description information in Sections 5.1 and 5.2.	Jeff Moser
3	2018-04-03	Included KDB 558074 reference in Section 2. Revised statement in Section 5.5 to include 1-18GHz range. Revised setup diagram in Section 5.6 Included bandedge method in Section 7. Corrected table headers in Section 8.6	Brian T. Kiewra

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Bose Corporation
100 The Mountain
Framingham, MA 01701, USA

EUT DESCRIPTION: Wireless Headset

MODEL: 424411

SERIAL NUMBER: Radiated: DP2 A038, DP2 A130, DP2 C005
Conducted: DP2 A144

DATE TESTED: 2018-02-07 to 2018-02-013

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Compliant
ISED CANADA RSS-247 Issue 2	Compliant
ISED CANADA RSS-GEN Issue 4	Compliant

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
Operations Leader
UL – Consumer Technology Division

Prepared By:



Brian T. Kiewra
Project Engineer
UL – Consumer Technology Division

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, KDB 558074 D01 v04, RSS-GEN Issue 4, RSS-247 Issue 2.

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 Perimeter Park Drive, Suite B, Morrisville, NC 27560.

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

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

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

UL LLC is accredited by NVLAP, Laboratory Code 200246-0. The full scope of accreditation can be viewed at <https://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:

$$\begin{aligned}\text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m}\end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY	Required by standard
Occupied Channel Bandwidth	2.00%	±5 %
RF output power, conducted	1.3 dB	±1,5 dB
Power Spectral Density, conducted	2.47 dB	±3 dB
Unwanted Emissions, conducted	2.94 dB	±3 dB
All emissions, radiated	5.36 dB	±6 dB
Temperature	2.26 °C	±3 °C
Supply voltages	2.40%	±3 %
Time	3.39%	±5 %

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a wireless headset containing an FHSS transceiver.

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)
2402 - 2480	GFSK	1.45	1.40

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes one chip antenna with a maximum gain of +2.2 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was v2.2.8.

The EUT driver software installed in the support equipment during testing was BoseUSB.

The test utility software used during testing was BlueTest 3, v2.6.2.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions 1-18GHz were performed with the EUT set to transmit on low, mid, and high channels. Radiated emission (<1GHz and >18GHz) and power line conducted emission 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,Z, it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Power Supply	Circuit Specialists	CS13005X5	NA	NA

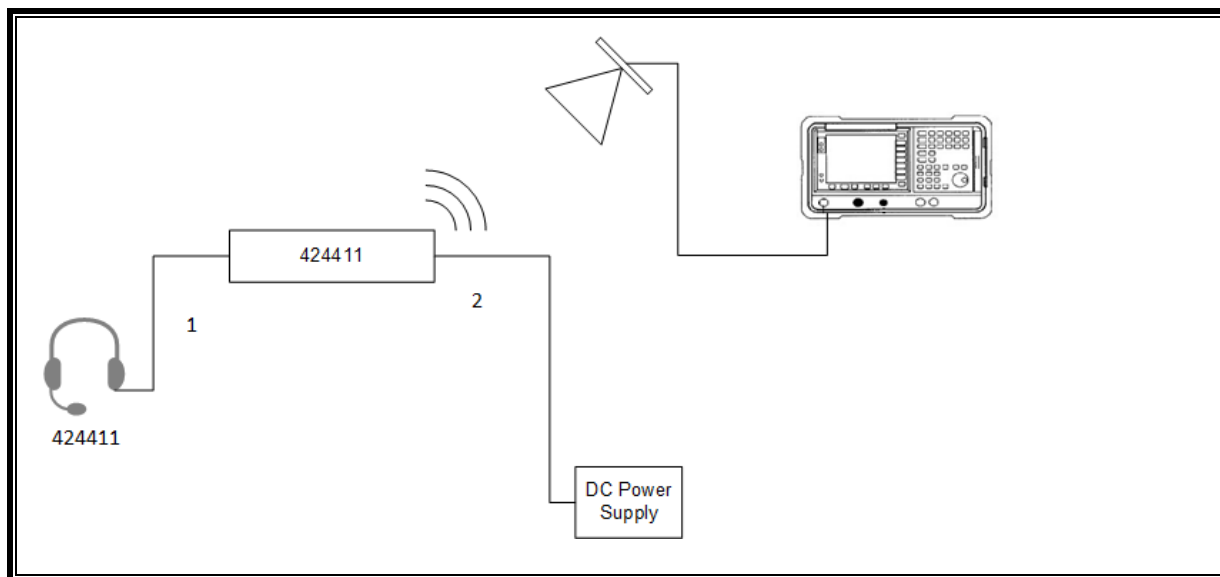
I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Audio	1	Hardwired	Audio	<3m	Audio connection to headset
2	DC	1	DC	DC	>3m	Provides DC power

TEST SETUP

The EUT is installed as a standalone device.

SETUP DIAGRAM FOR TESTS



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 - North Chamber)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
0.009-30MHz (Loop Ant.)					
AT0059	Active Loop Antenna	ETS-Lindgren	6502	2017-06-05	2018-06-05
30-1000 MHz					
AT0073	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2017-07-18	2018-07-31
1-18 GHz					
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2017-04-05	2018-04-05
18-40 GHz					
AT0076	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2017-10-10	2018-10-10
AT0077	Horn Antenna, 26-40GHz	ARA	MWH-2640/B	2017-10-10	2018-10-10
Gain-Loss Chains					
N-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2017-09-15	2018-09-15
N-SAC02	Gain-loss string: 30-1000MHz	Various	Various	2017-06-11	2018-06-11
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2017-08-18	2018-08-18
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
SOFTMI	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

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

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
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-SAC03	Gain-loss string: 1-18GHz	Various	Various	2017-12-31	2018-12-31
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 (Morrisville – Conducted 2)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
SA0020	Spectrum Analyzer	Agilent Technologies	E4446A	2017-11-06	2018-11-06
PWM002	RF Power Meter	Keysight Technologies	N1911A	2017-07-17	2018-07-17
PWS004	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2017-07-17	2018-07-17
SN 161016511	Environmental Meter	Fisher Scientific	15-077-963	2016-12-21	2018-12-21

Test Equipment Used - Line-Conducted Emissions – Voltage (Morrisville – Conducted 1)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL076	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3476-240	2017-06-12	2018-06-12
s/n 160938893	Environmental Meter	Fisher Scientific	14-650-118	2016-11-02	2018-11-02
LISN003	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2017-08-22	2018-08-22
PRE0101521 (75141)	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2017-08-23	2018-08-23
TL001	Transient Limiter, 0.009-30MHz	Com-Power	LIT-930A	2017-06-12	2018-06-12
PS215	AC Power Source	Elgar	CW2501M (s/n 1523A02397)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
MM0168	Multi-meter	Agilent	U1232A	2017-09-25	2018-09-30

7. MEASUREMENT METHODS

Duty Cycle: KDB 558074 D01 v04 Section 6.0

6 dB BW: KDB 558074 D01 v04 Section 8.1

99% Occupied Bandwidth: ANSI C63.10-2013, Section 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

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

Line Conducted Emissions: ANSI C63.10:2013 Sections 6.2

Band Edge: KDB 558074 D01 v04, Section 12.1

8. ANTENNA PORT TEST RESULTS

8.1.ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

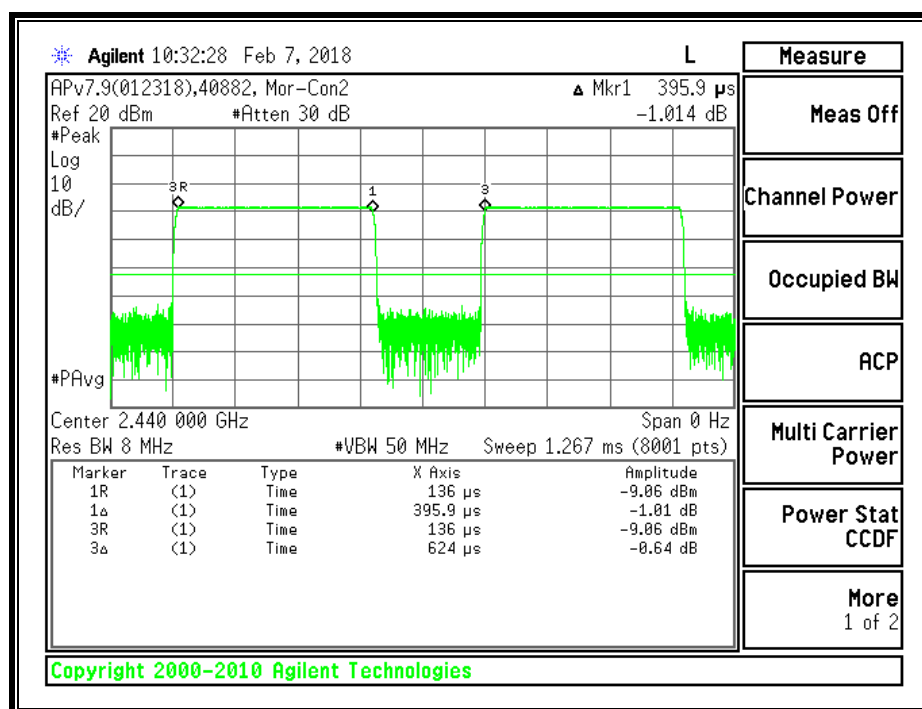
PROCEDURE

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)
GFSK	0.396	0.624	0.634	63.45%	1.98	2.526

DUTY CYCLE PLOTS



TEST INFORMATION

Test Date: 2018-02-07

Project No: 12161950

Tested By: Jeffrey Cabrera

8.2. 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.

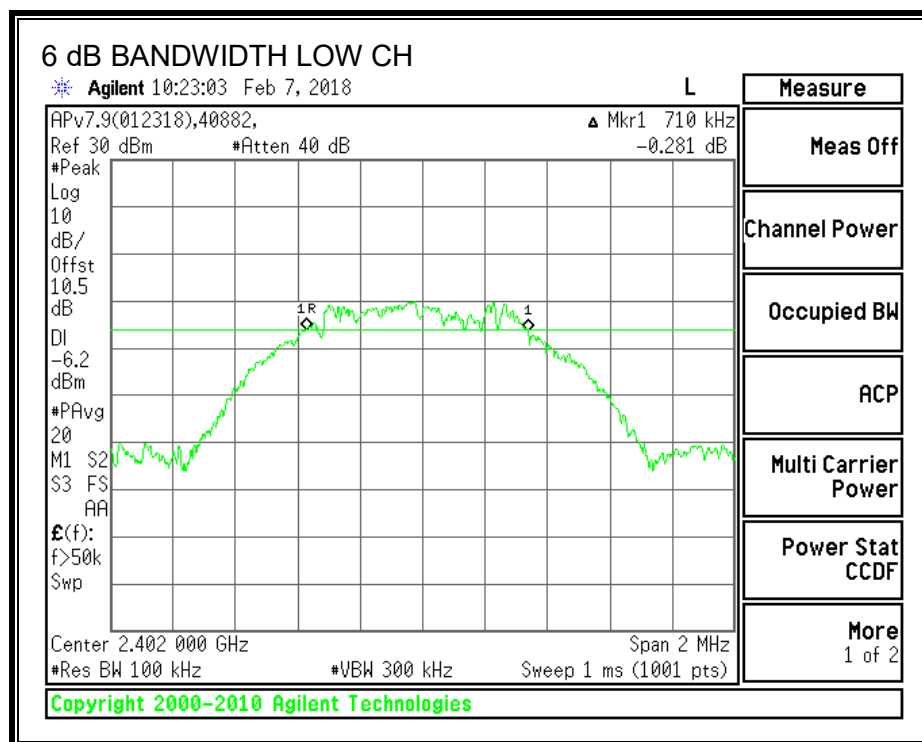
TEST INFORMATION

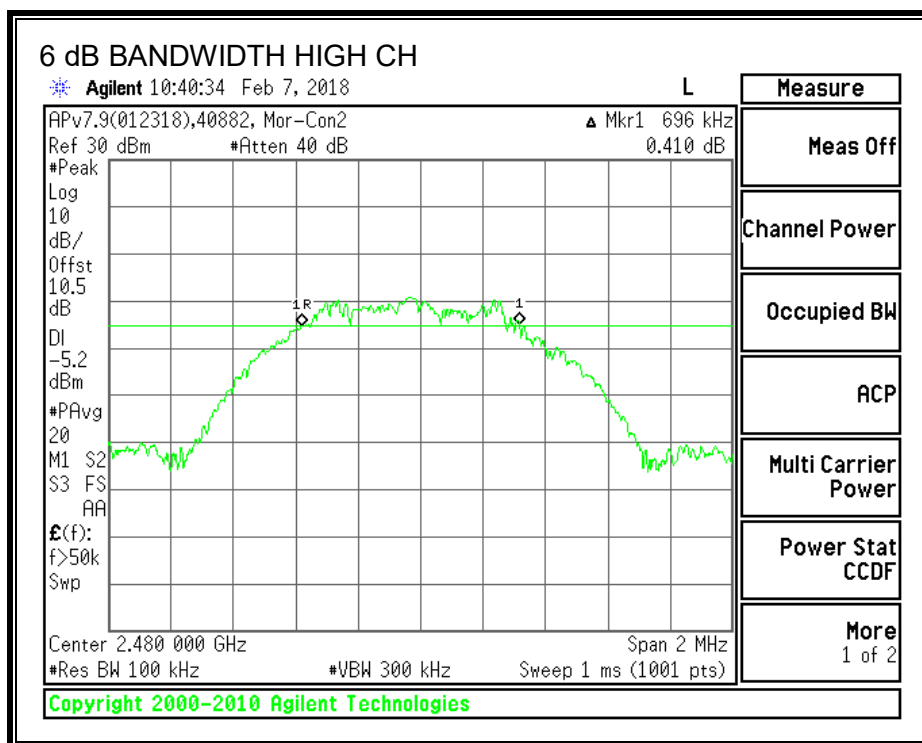
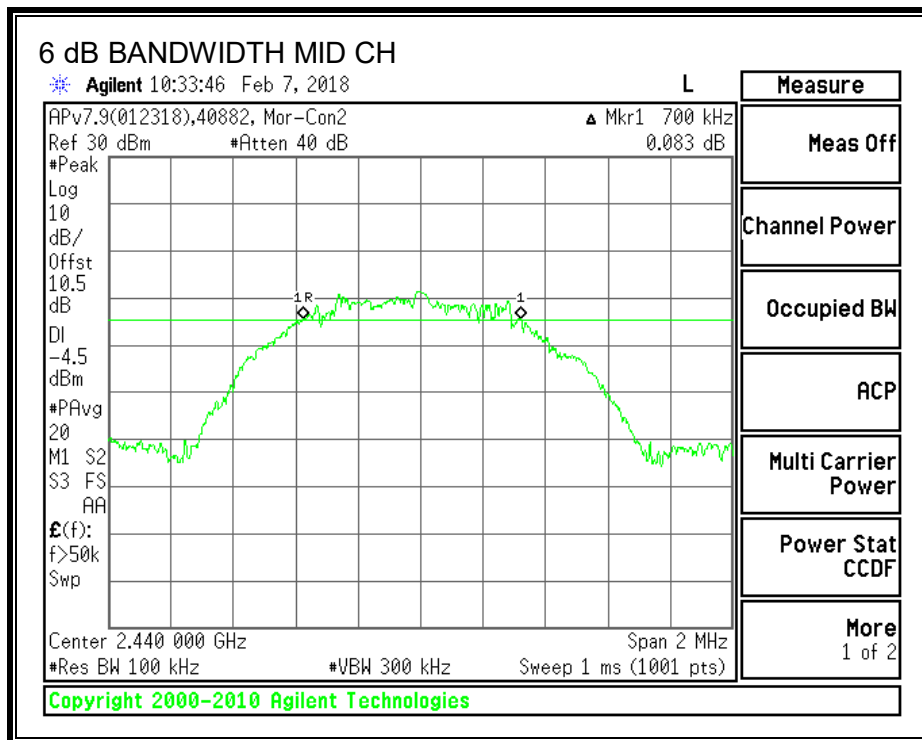
Test Date: 2018-02-07
Project No: 12161950
Tested By: Jeffrey Cabrera

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.710	0.5
Middle	2440	0.700	0.5
High	2480	0.696	0.5

6 dB BANDWIDTH





8.3.99% BANDWIDTH

LIMITS

None; for reporting purposes only.
Test per RSS-GEN Clause 5.6

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.

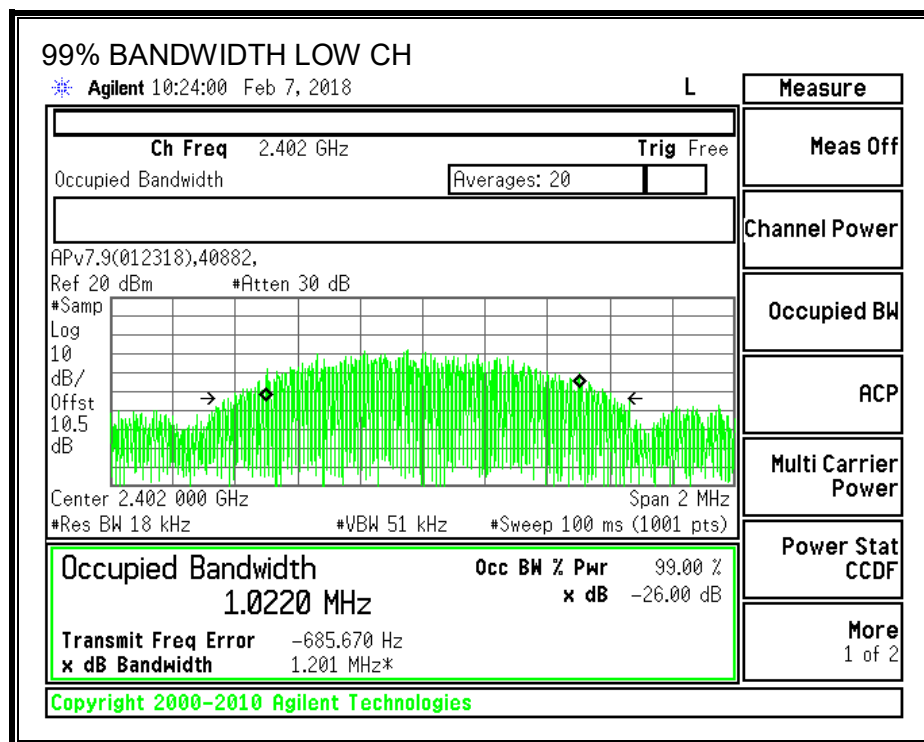
TEST INFORMATION

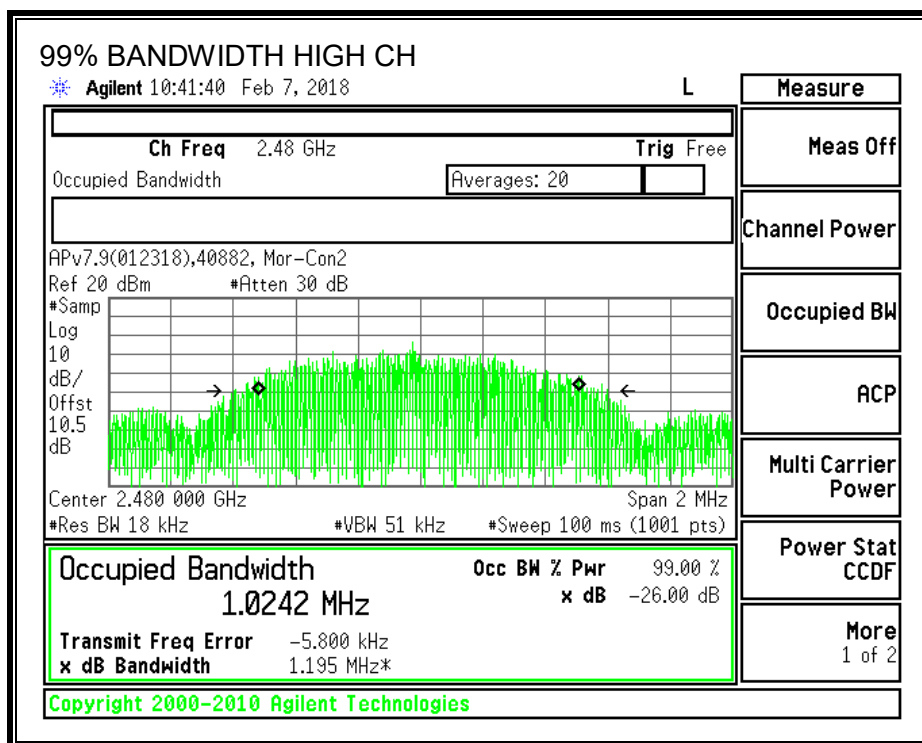
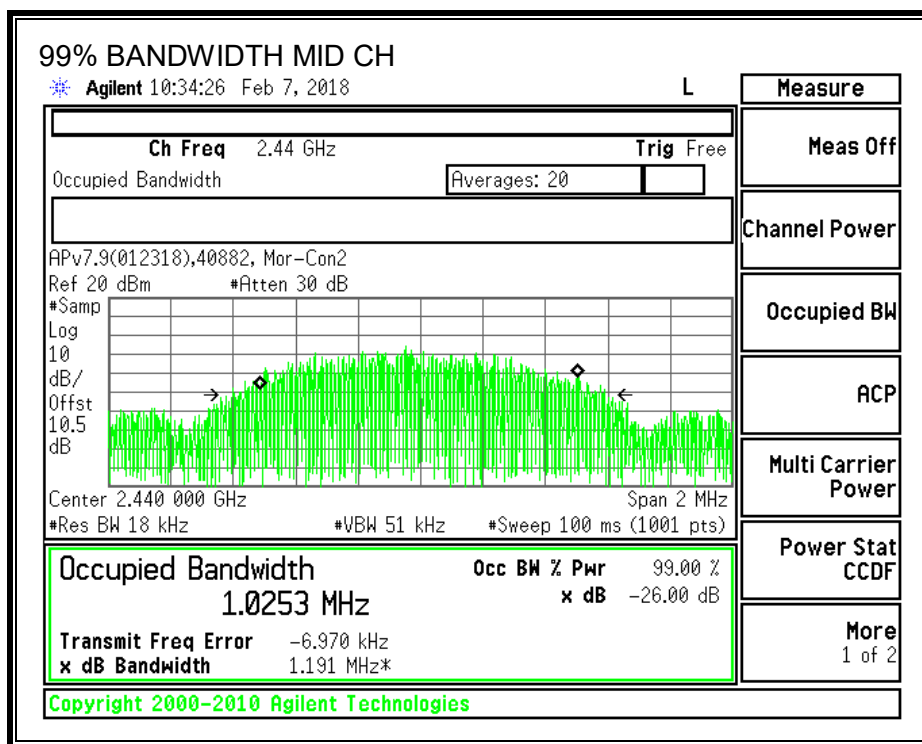
Test Date: 2018-02-07
Project No: 12161950
Tested By: Jeffrey Cabrera

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0220
Middle	2440	1.0253
High	2480	1.0242

99% BANDWIDTH PLOTS





8.4. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-247 5.4 (d)

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	2402	0.25	30	-29.75
Middle	2440	1.45	30	-28.55
High	2480	0.94	30	-29.06

TEST INFORMATION

Test Date: 2018-02-07

Project No: 12161950

Tested By: Jeffrey Cabrera

8.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 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	-0.23
Middle	2440	1.07
High	2480	0.68

Note: Measurement is a gated average measurement.

TEST INFORMATION

Test Date: 2018-02-07

Project No: 12161950

Tested By: Jeffrey Cabrera

8.6. 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.

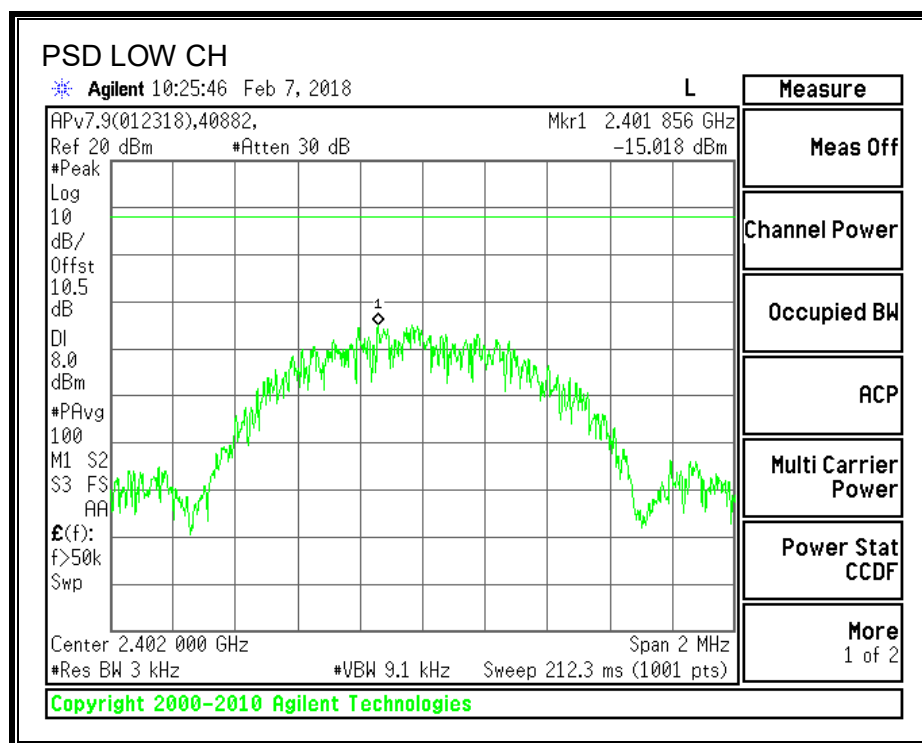
TEST INFORMATION

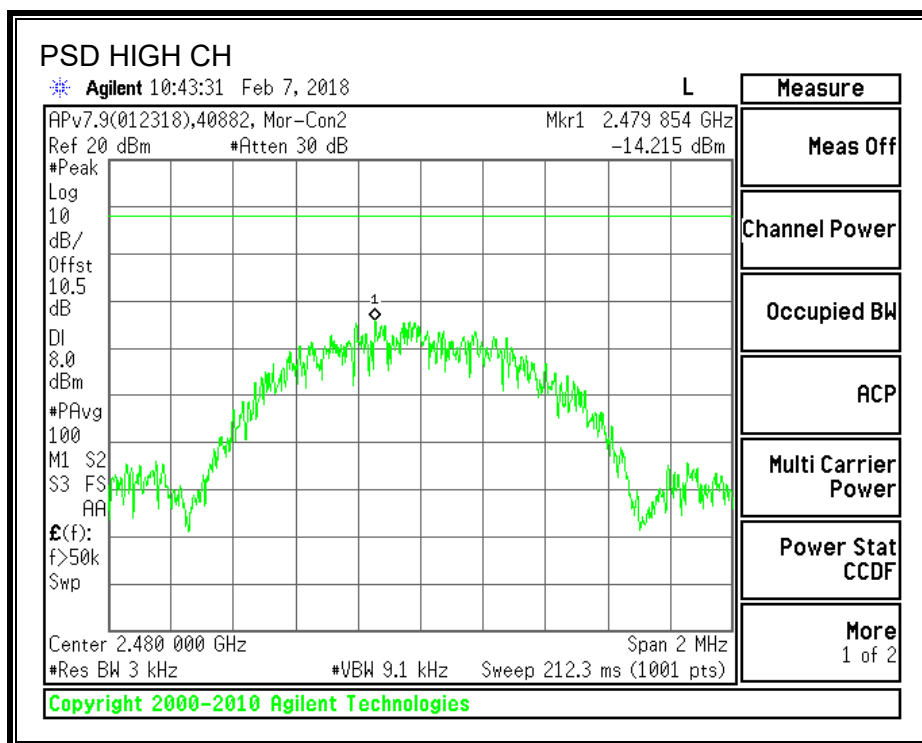
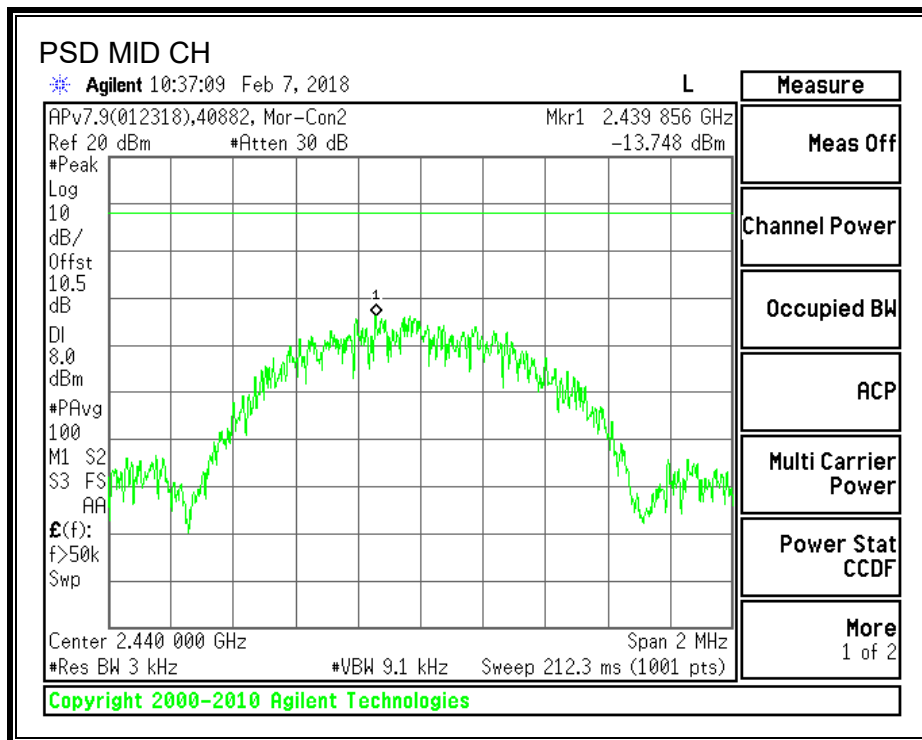
Test Date: 2018-02-07
Project No: 12161950
Tested By: Jeffrey Cabrera

RESULTS

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-15.02	8	-23.02
Middle	2440	-13.75	8	-21.75
High	2480	-14.22	8	-22.22

POWER SPECTRAL DENSITY





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.

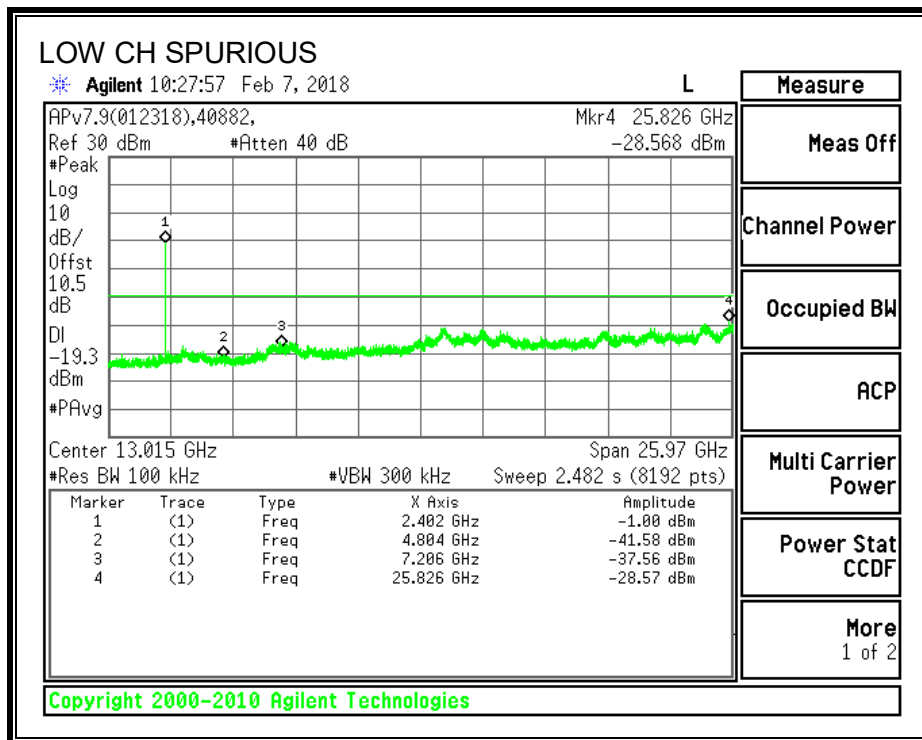
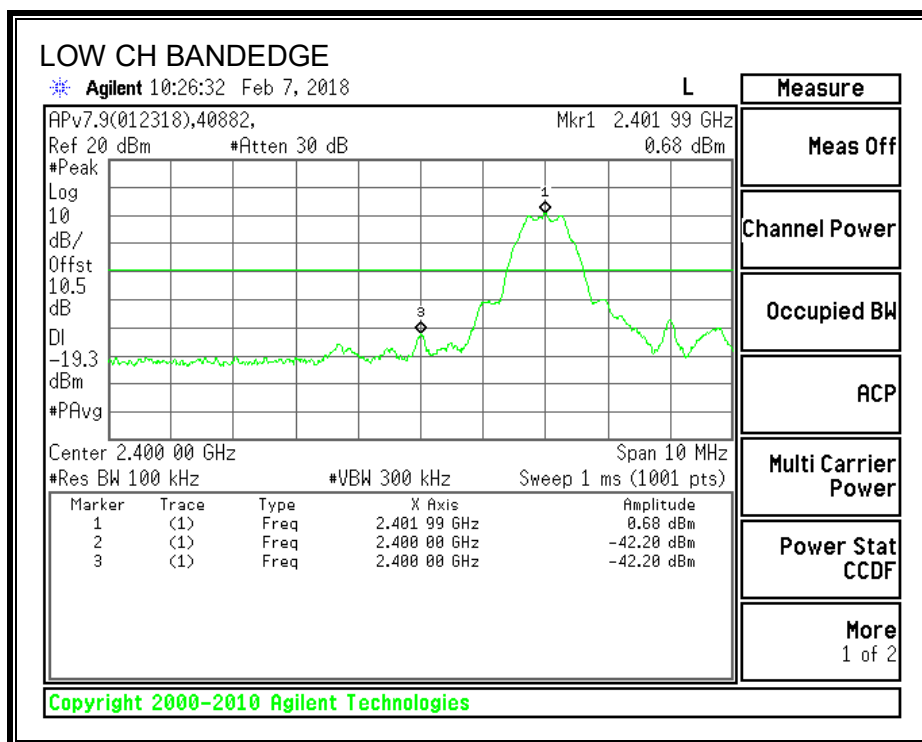
TEST INFORMATION

Test Date: 2018-02-07

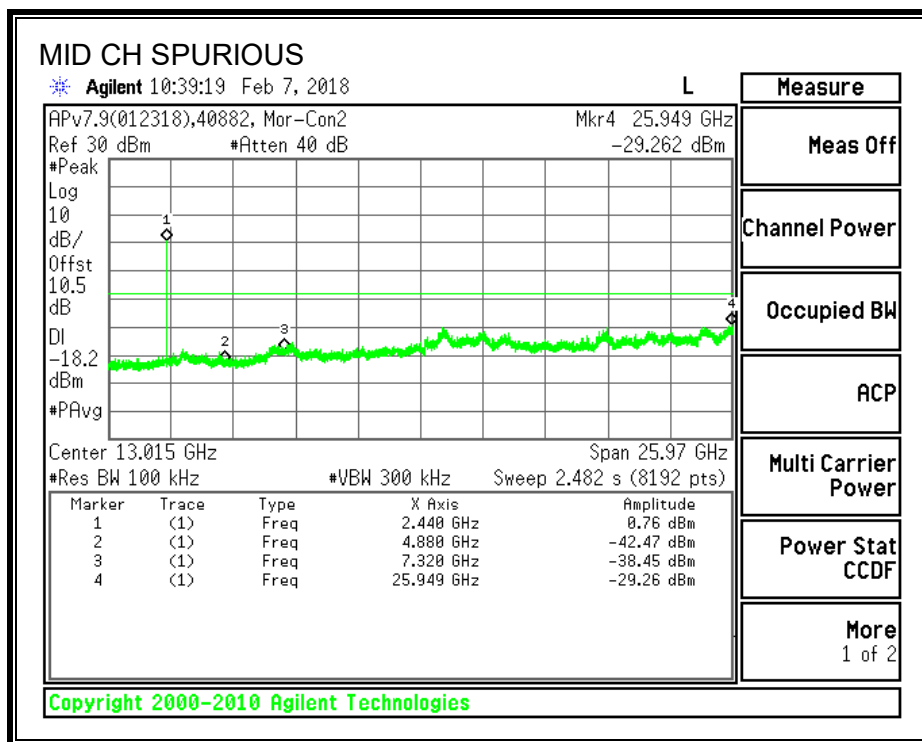
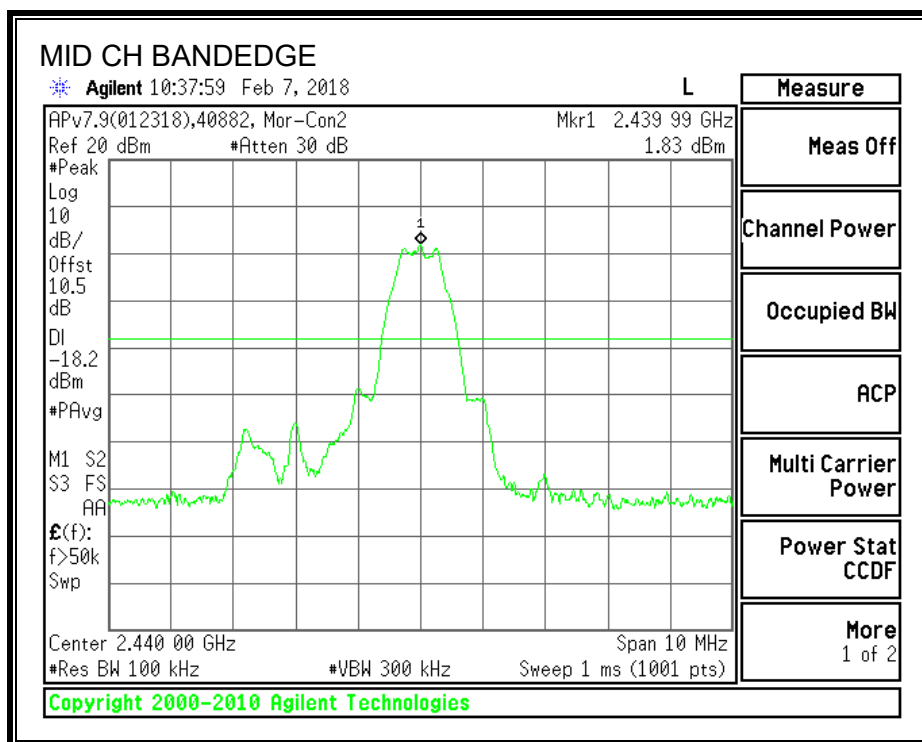
Project No: 12161950

Tested By: Jeffrey Cabrera

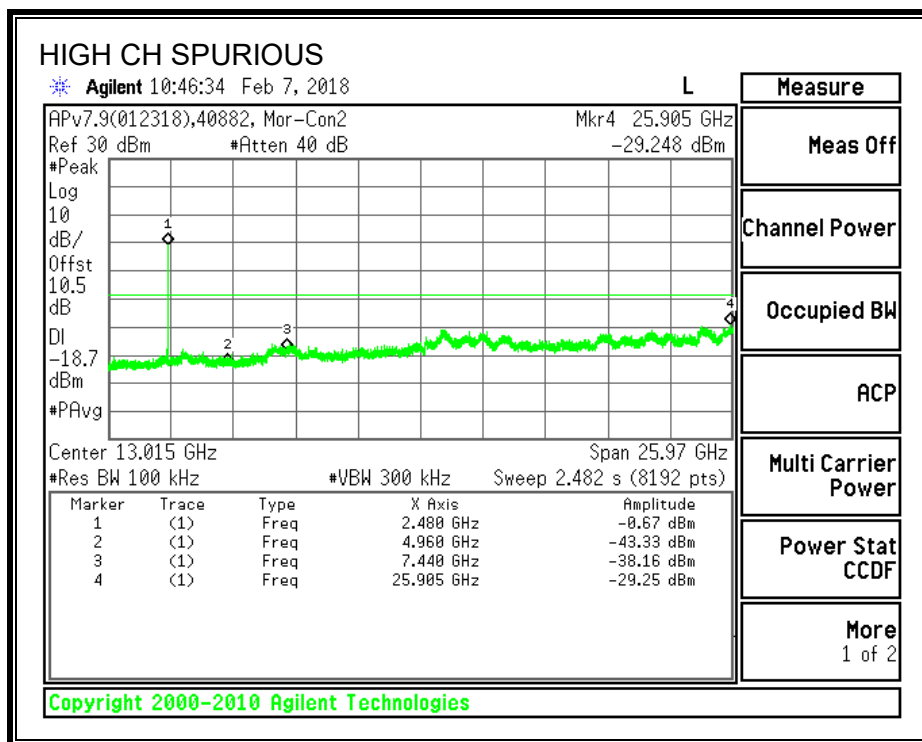
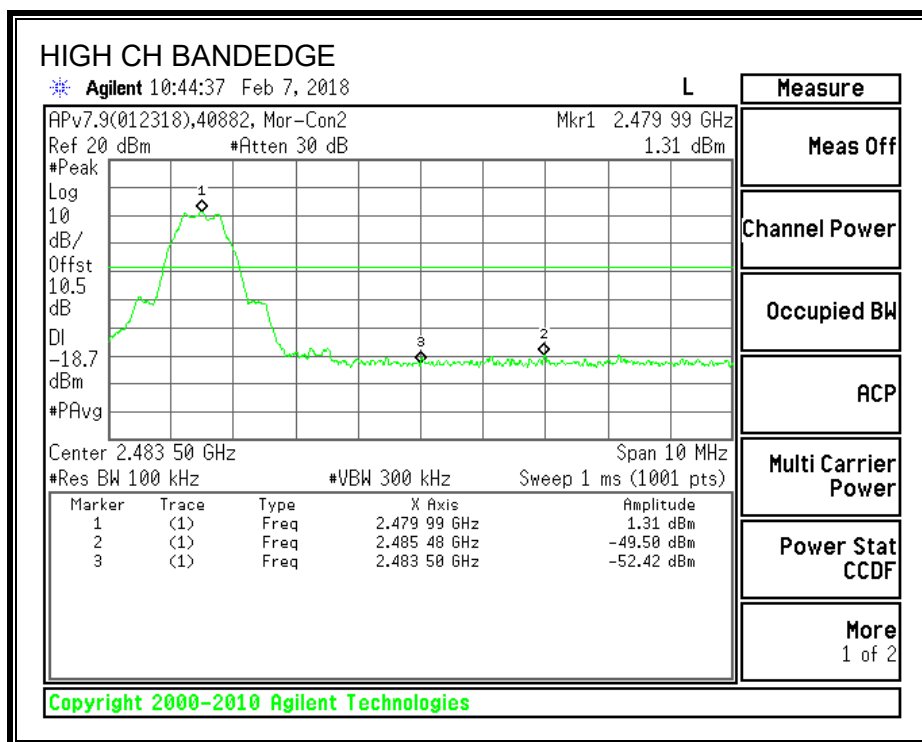
SPURIOUS EMISSIONS, LOW CHANNEL



SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL



9. RADIATED TEST RESULTS

9.1. 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.

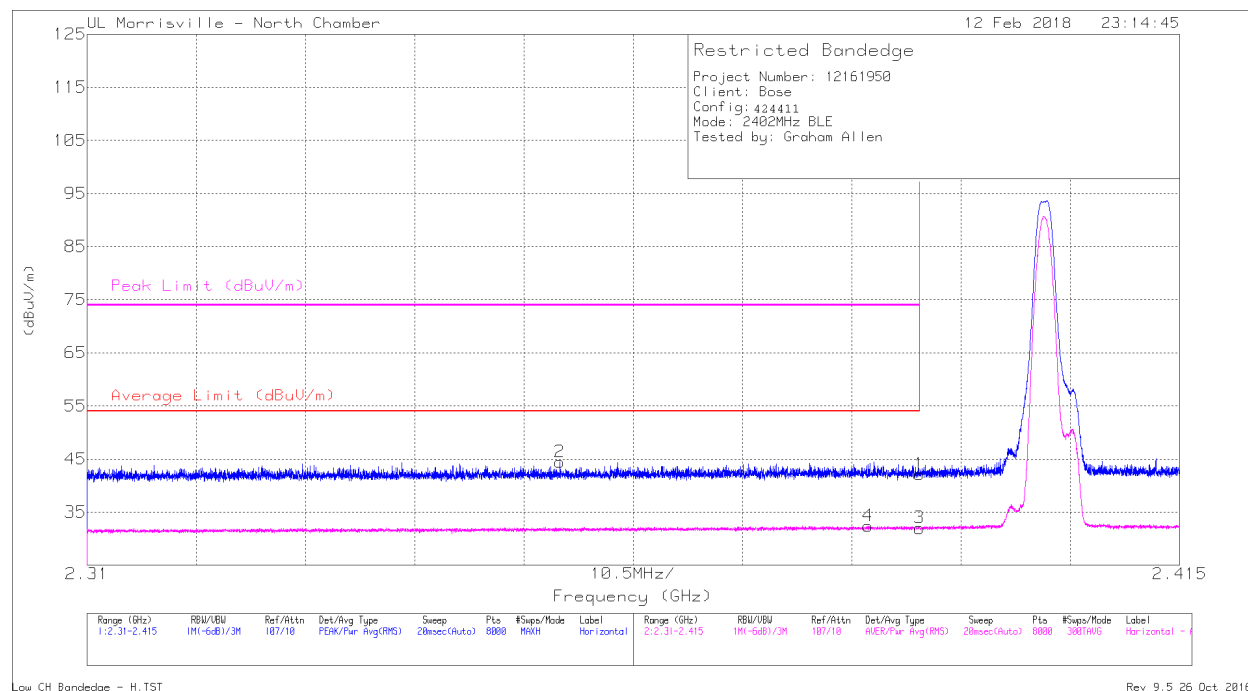
For peak measurements above 1 GHz, the resolution bandwidth is set to 1 MHz and the video bandwidth is set to 3 MHz. For average measurements above 1GHz, the resolution bandwidth and video bandwidth are set as described in ANSI C63.10:2013 for the applicable measurement. The particular averaging method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

The spectrum from 1 to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. The spectrum from 9kHz to 1000MHz and 18 to 26GHz was investigated on the worst-case channel.

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.

9.2. TX ABOVE 1 GHz FOR DSSS MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



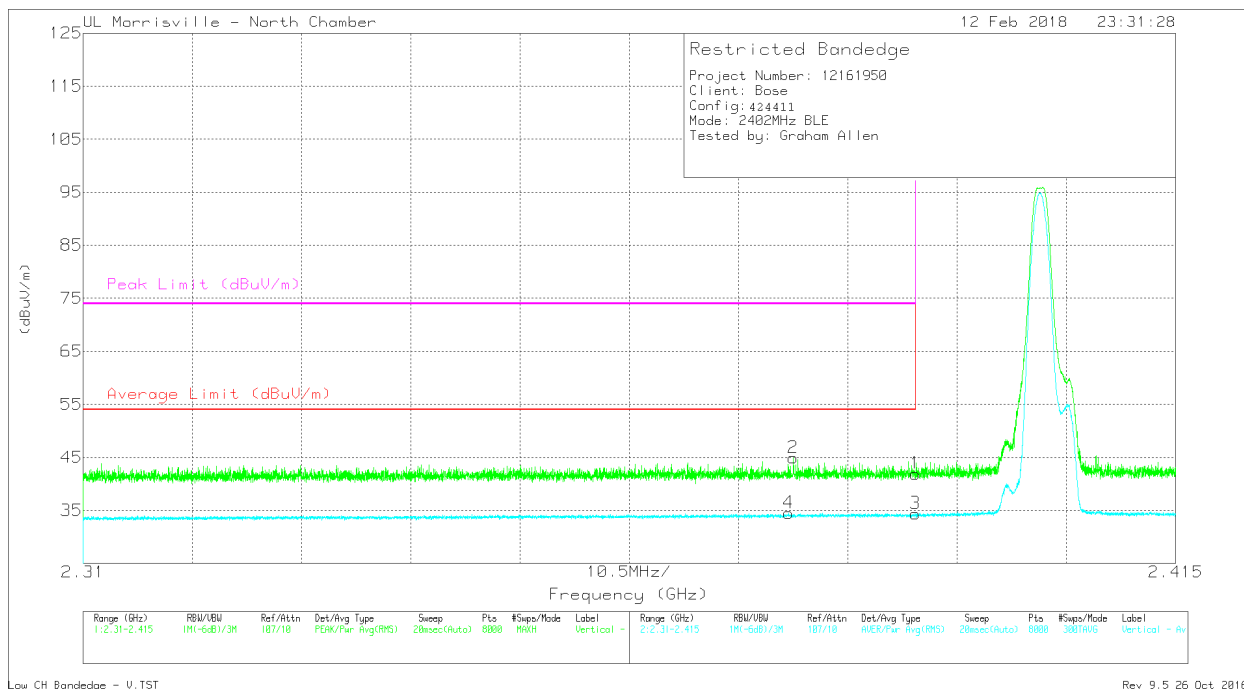
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	34.2	Pk	31.8	-23.9	0	42.1	-	-	74	-31.9	134	119	H
2	* 2.355	36.63	Pk	31.7	-23.9	0	44.43	-	-	74	-29.57	134	119	H
3	* 2.39	24.08	RMS	31.8	-23.9	1.98	33.96	54	-20.04	-	-	134	119	H
4	* 2.385	24.51	RMS	31.8	-23.9	1.98	34.39	54	-19.61	-	-	134	119	H

* - indicates frequency in CFR47 Pt 15 / IC RSS / LP0002 - Restricted Band

Pk - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



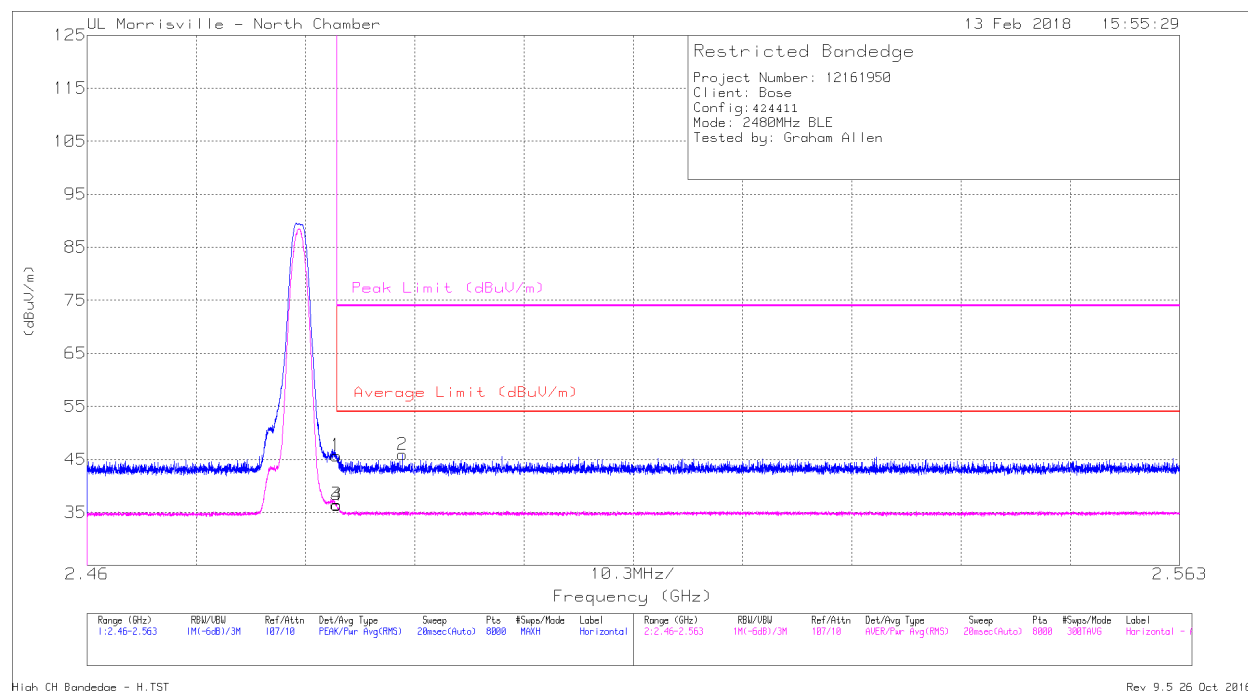
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	34.02	Pk	31.8	-23.9	0	41.92	-	-	74	-32.08	25	152	V
2	* 2.378	37.04	Pk	31.8	-23.9	0	44.94	-	-	74	-29.06	25	152	V
3	* 2.39	24.52	RMS	31.8	-23.9	1.98	34.4	54	-19.6	-	-	25	152	V
4	* 2.378	24.65	RMS	31.8	-23.9	1.98	34.53	54	-19.47	-	-	25	152	V

* - indicates frequency in CFR47 Pt 15 / IC RSS / LP0002 - Restricted Band

Pk - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



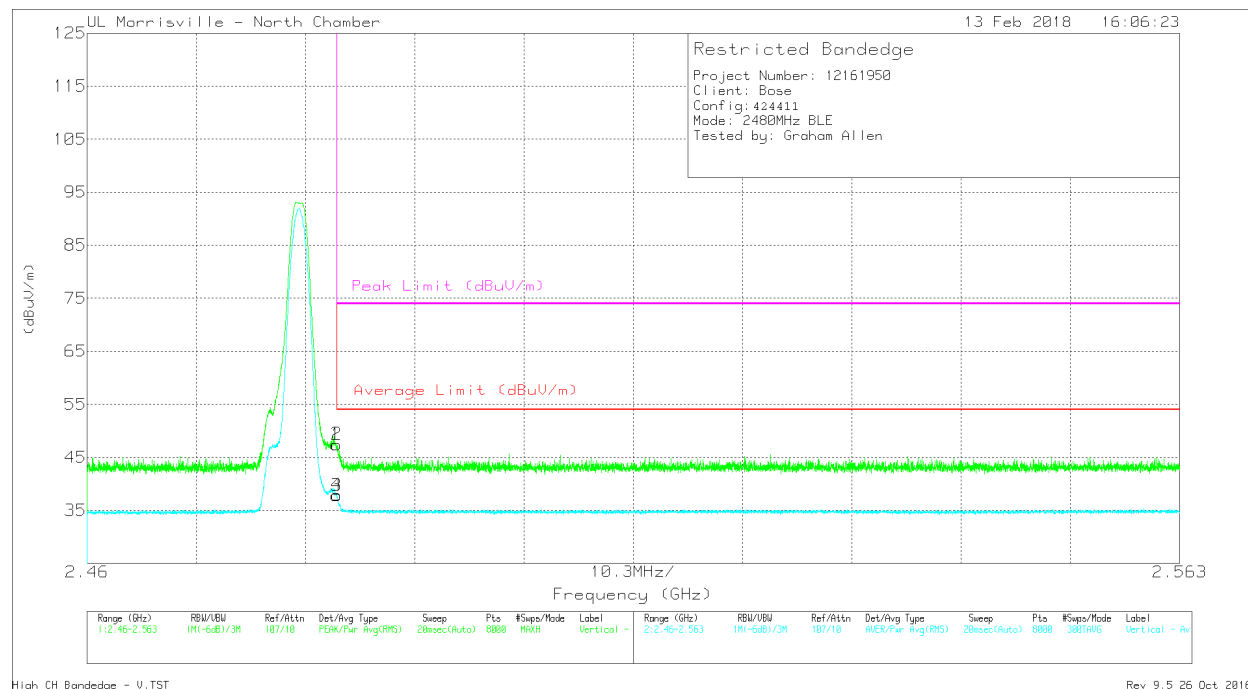
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	37.21	Pk	32.3	-23.8	0	45.71	-	-	74	-28.29	149	135	H
2	* 2.49	37.44	Pk	32.3	-23.8	0	45.94	-	-	74	-28.06	149	135	H
3	* 2.484	26.03	RMS	32.3	-23.8	1.98	36.51	54	-17.49	-	-	149	135	H
4	* 2.484	25.81	RMS	32.3	-23.8	1.98	36.29	54	-17.71	-	-	149	135	H

* - indicates frequency in CFR47 Pt 15 / IC RSS / LP0002 - Restricted Band

Pk - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



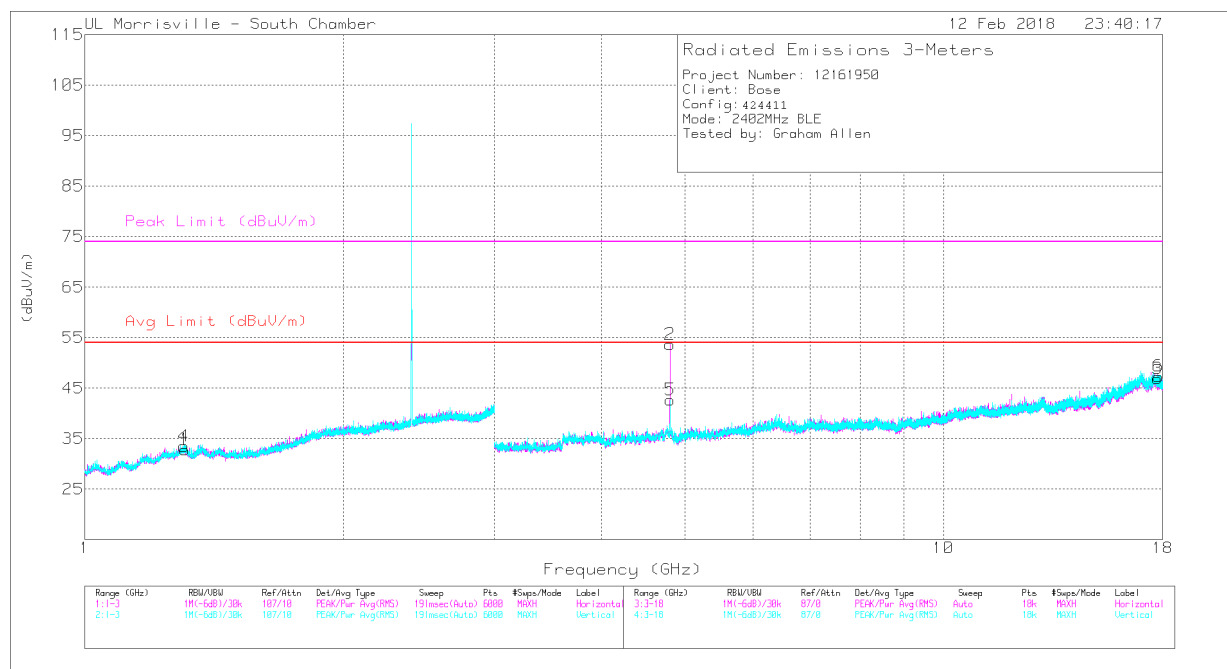
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	38.92	Pk	32.3	-23.8	0	47.42	-	-	74	-26.58	348	142	V
2	* 2.484	38.95	Pk	32.3	-23.8	0	47.45	-	-	74	-26.55	348	142	V
3	* 2.484	27.32	RMS	32.3	-23.8	1.98	37.8	54	-16.2	-	-	348	142	V
4	* 2.484	27.44	RMS	32.3	-23.8	1.98	37.92	54	-16.08	-	-	348	142	V

* - indicates frequency in CFR47 Pt 15 / IC RSS / LP0002 - Restricted Band

Pk - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS



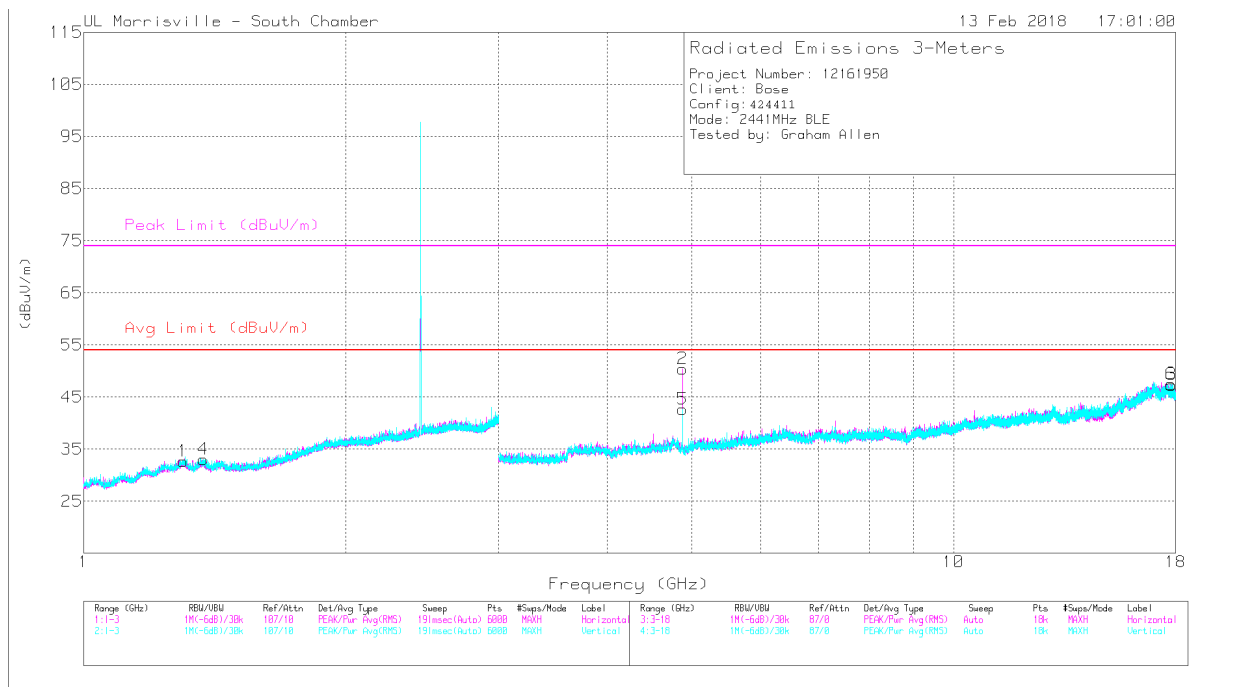
Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 1.307	35.31	PK2	29.3	-25.1	0	39.51	-	-	74	-34.49	211	118	H
	*** 1.307	23.39	MAv1	29.3	-25.1	1.98	29.57	54	-24.43	-	-	211	118	H
4	*** 1.306	36.63	PK2	29.3	-25.1	0	40.83	-	-	74	-33.17	83	252	V
	*** 1.306	24.37	MAv1	29.3	-25.1	1.98	30.55	54	-23.45	-	-	83	252	V
2	*** 4.804	53.29	PK2	34.1	-31.1	0	56.29	-	-	74	-17.71	142	118	H
	*** 4.804	47.06	MAv1	34.1	-31.1	1.98	52.04	54	-1.96	-	-	142	118	H
3	*** 17.744	34.42	PK2	41.2	-21.8	0	53.82	-	-	74	-20.18	231	117	H
	*** 17.744	22.37	MAv1	41.2	-21.8	1.98	43.75	54	-10.25	-	-	231	117	H
5	*** 4.803	45.95	PK2	34.1	-31.1	0	48.95	-	-	74	-25.05	158	193	V
	*** 4.804	36.69	MAv1	34.1	-31.1	1.98	41.67	54	-12.33	-	-	158	193	V
6	*** 17.794	35.29	PK2	41.2	-21.4	0	55.09	-	-	74	-18.91	104	360	V
	*** 17.794	22.33	MAv1	41.2	-21.4	1.98	44.11	54	-9.89	-	-	104	360	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK2 - Maximum Peak

MAv1 - Maximum RMS Average



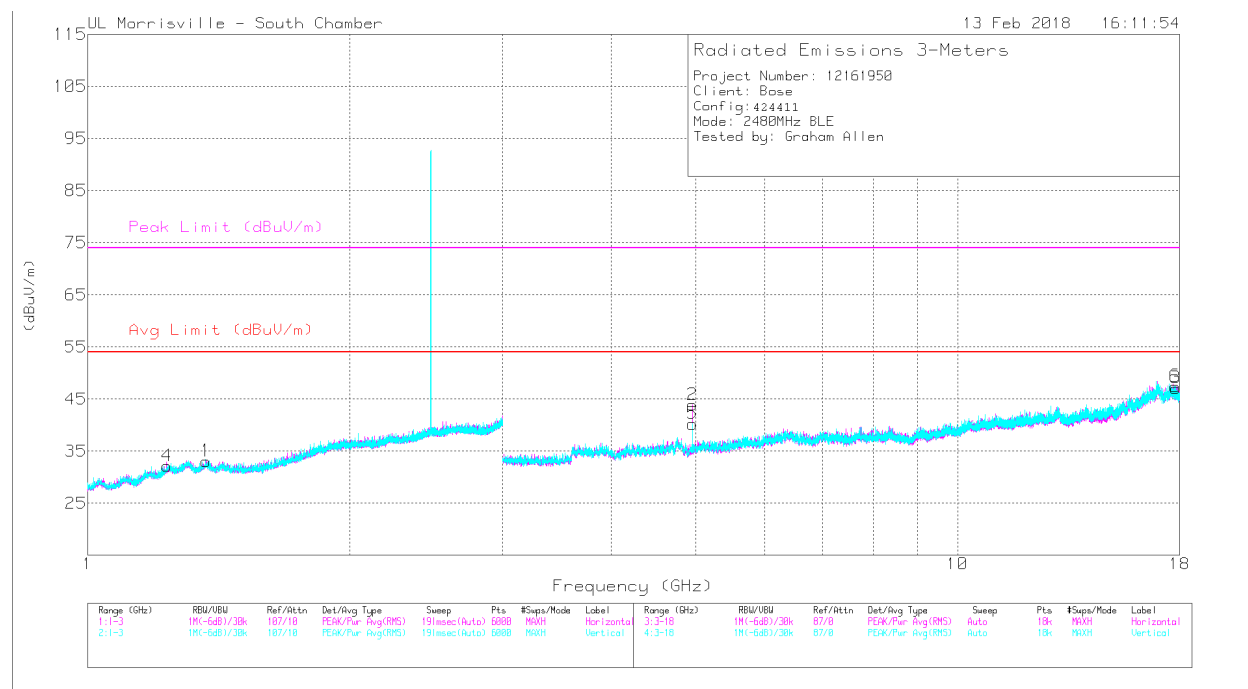
Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 1.301	36.4	PK2	29.4	-25.2	0	40.6	-	-	74	-33.4	51	270	H
	*** 1.301	24.02	MAv1	29.4	-25.2	1.98	30.2	54	-23.8	-	-	51	270	H
4	*** 1.371	36.22	PK2	29	-24.9	0	40.32	-	-	74	-33.68	208	225	V
	*** 1.371	23.85	MAv1	29	-24.9	1.98	29.93	54	-24.07	-	-	208	225	V
2	*** 4.88	50.93	PK2	34	-31	0	53.93	-	-	74	-20.07	139	125	H
	*** 4.88	44.16	MAv1	34	-31	1.98	49.14	54	-4.86	-	-	139	125	H
3	*** 17.8	34.39	PK2	41.2	-21.4	0	54.19	-	-	74	-19.81	154	122	H
	*** 17.8	22.43	MAv1	41.2	-21.4	1.98	44.21	54	-9.79	-	-	154	122	H
5	*** 4.88	46.56	PK2	34	-31	0	49.56	-	-	74	-24.44	155	108	V
	*** 4.88	39.49	MAv1	34	-31	1.98	44.47	54	-9.53	-	-	155	108	V
6	*** 17.793	34.33	PK2	41.2	-21.4	0	54.13	-	-	74	-19.87	190	289	V
	*** 17.793	21.76	MAv1	41.2	-21.4	1.98	43.54	54	-10.46	-	-	190	289	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK2 - Maximum Peak

MAv1 - Maximum RMS Average



Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Filtr/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	*** 1.368	36.77	PK2	29	-24.9	0	40.87	-	-	74	-33.13	143	309	H
	*** 1.368	24.29	MAv1	29	-24.9	1.98	30.37	54	-23.63	-	-	143	309	H
2	*** 4.96	46.78	PK2	34.1	-31.8	0	49.08	-	-	74	-24.92	135	111	H
	*** 4.96	37.83	MAv1	34.1	-31.8	1.98	42.11	54	-11.89	-	-	135	111	H
3	*** 17.801	34.56	PK2	41.2	-21.4	0	54.36	-	-	74	-19.64	170	183	H
	*** 17.801	22.53	MAv1	41.2	-21.4	1.98	44.31	54	-9.69	-	-	170	183	H
4	*** 1.233	36.69	PK2	28.7	-25.5	0	39.89	-	-	74	-34.11	36	233	V
	*** 1.234	24.41	MAv1	28.7	-25.5	1.98	29.59	54	-24.41	-	-	36	233	V
5	*** 4.96	43.24	PK2	34.1	-31.8	0	45.54	-	-	74	-28.46	156	104	V
	*** 4.96	32.61	MAv1	34.1	-31.8	1.98	36.89	54	-17.11	-	-	156	104	V
6	*** 17.795	34.39	PK2	41.2	-21.4	0	54.19	-	-	74	-19.81	353	229	V
	*** 17.795	22.33	MAv1	41.2	-21.4	1.98	44.11	54	-9.89	-	-	353	229	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK2 - Maximum Peak

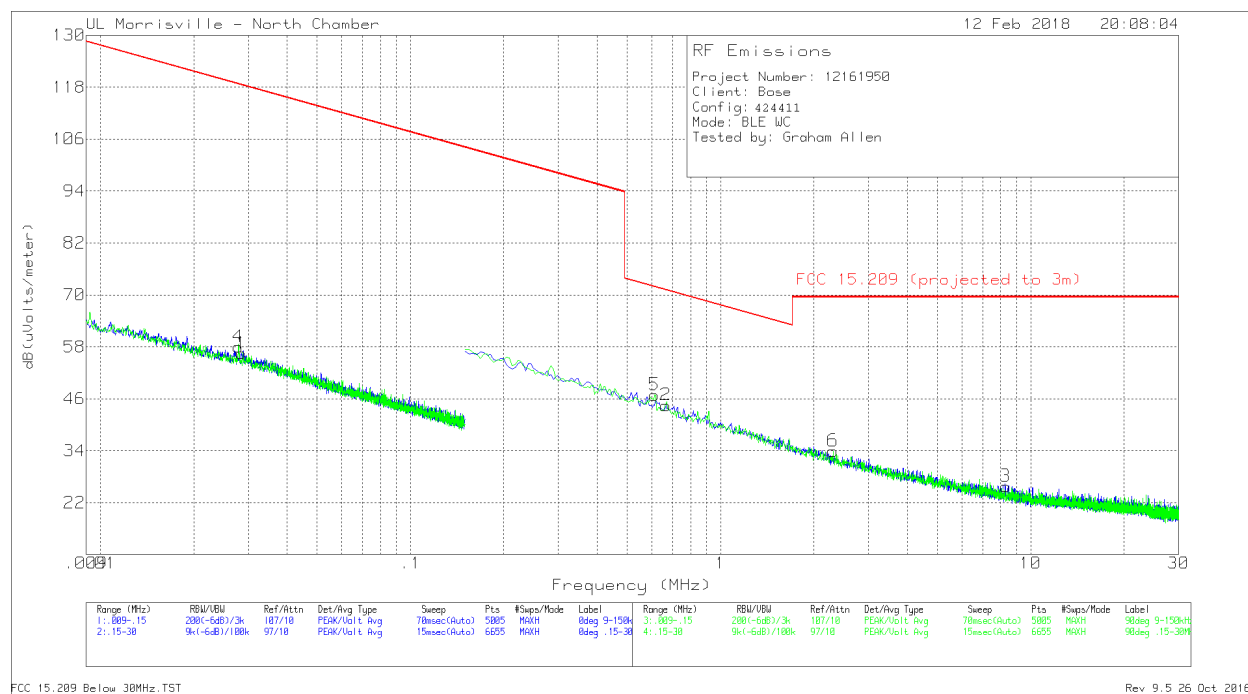
MAv1 - Maximum RMS Average

9.3. WORST-CASE BELOW 1 GHz

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

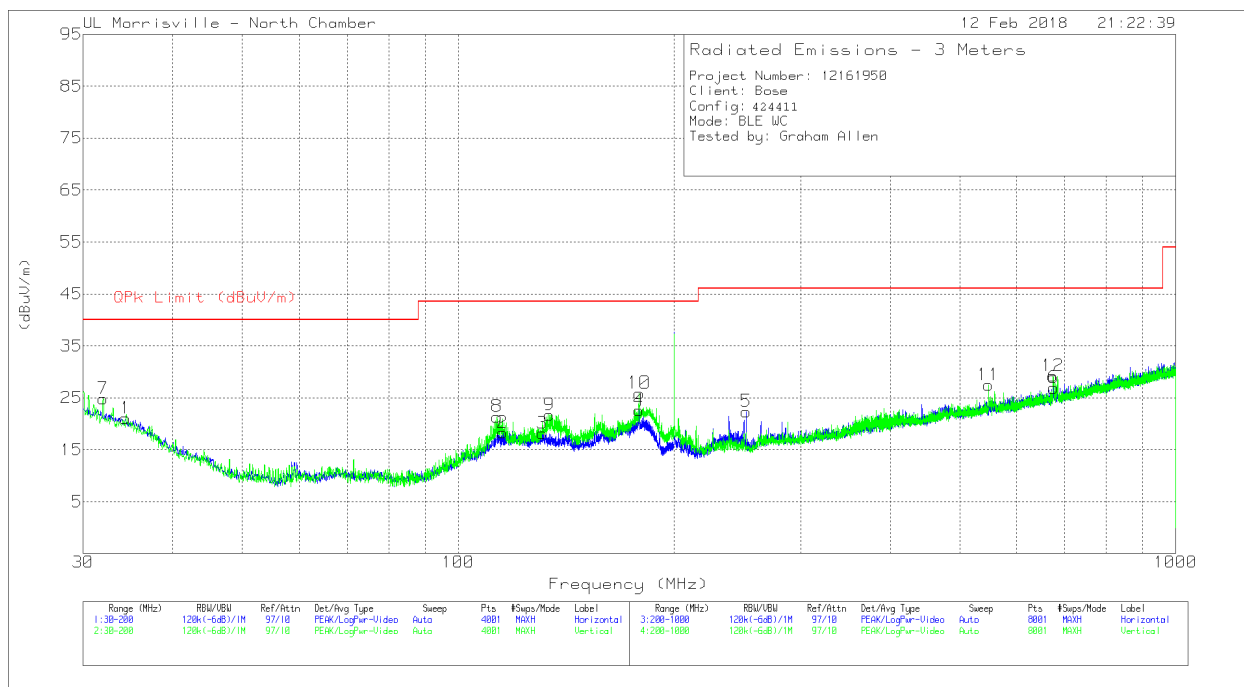
Note: All measurements were made at a test distance of 3 m. The limits in the plots and tabular data are the FCC/IC limits extrapolated from the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to the measurement distance to clearly show the relative levels of fundamental 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 $40 \cdot \log(\text{specification distance} / \text{test distance})$.

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 414788.



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Corrected Reading dB(uV/m)	FCC 15.209 QP (projected to 3m)	QP Margin (dB)	FCC 15.209 AV (projected to 3m)	AV Margin (dB)	FCC 15.209 PK (projected to 3m)	PK Margin (dB)	Azimuth (Degs)	Face
1	.02846	42.69	Pk	13.7	.1	56.49	-	-	118.52	-62.03	138.52	-82.03	0-360	On
4	.02782	44.06	Pk	13.8	.1	57.96	-	-	118.72	-60.76	138.72	-80.76	0-360	Off
2	.66589	32.92	Pk	11.5	.1	44.52	71.14	-26.62	-	-	-	-	0-360	On
3	8.30555	14.18	Pk	11.1	.5	25.78	69.54	-43.76	-	-	-	-	0-360	On
5	.61206	35.3	Pk	11.5	.1	46.9	71.87	-24.97	-	-	-	-	0-360	Off
6	2.30328	22.14	Pk	11.6	.2	33.94	69.54	-35.6	-	-	-	-	0-360	Off

Pk - Peak detector

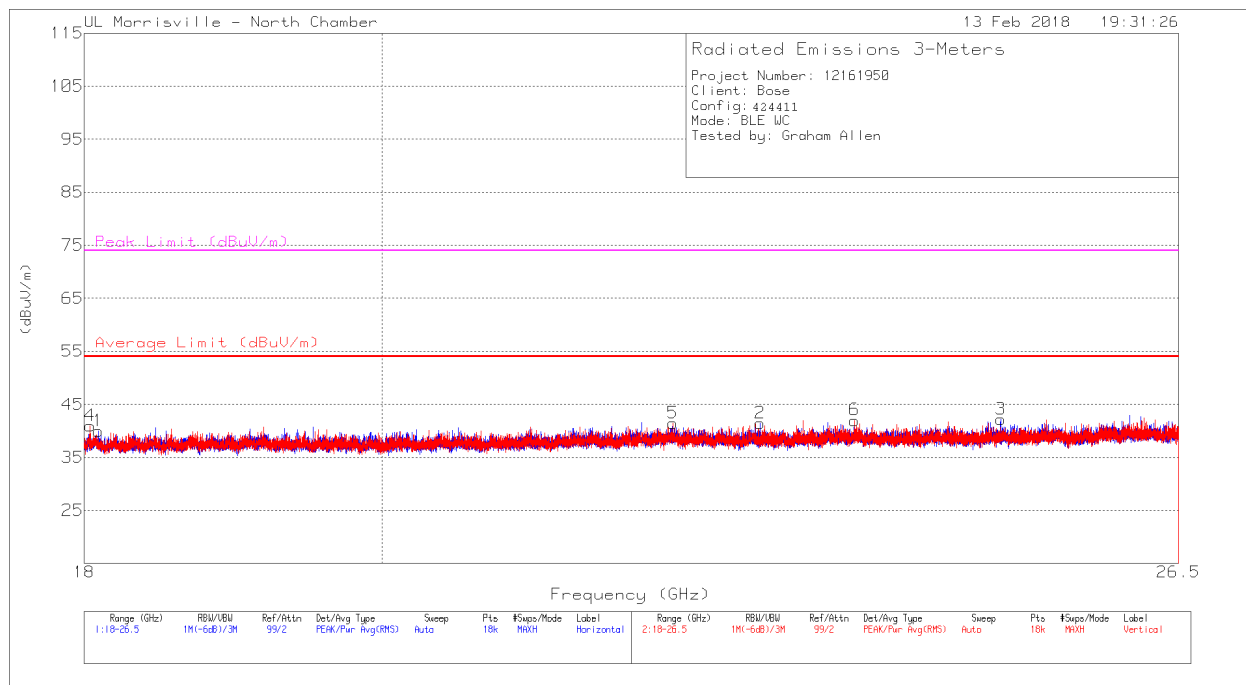


Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	34.3786	29.16	Pk	23.6	-31.7	21.06	40	-18.94	0-360	98	H
2	* ** 115.2346	30.42	Pk	18.6	-30.7	18.32	43.52	-25.2	0-360	198	H
3	* ** 131.0486	29.84	Pk	19	-30.7	18.14	43.52	-25.38	0-360	198	H
4	178.746	36.54	Pk	16.2	-30.2	22.54	43.52	-20.98	0-360	198	H
5	* ** 251.9067	34.95	Pk	17.2	-29.8	22.35	46.02	-23.67	0-360	103	H
6	675.6618	29.72	Pk	25.1	-27.9	26.92	46.02	-19.1	0-360	298	H
8	* ** 113.279	33.77	Pk	18.4	-30.8	21.37	43.52	-22.15	0-360	102	V
9	* ** 133.9819	33.45	Pk	18.8	-30.6	21.65	43.52	-21.87	0-360	102	V
7	31.998	31.15	Pk	25.4	-31.7	24.85	40	-15.15	0-360	102	V
10	178.831	39.89	Pk	16.2	-30.2	25.89	43.52	-17.63	0-360	102	V
11	548.3453	32.26	Pk	23.6	-28.4	27.46	46.02	-18.56	0-360	103	V
12	674.5617	31.94	Pk	25.1	-27.8	29.24	46.02	-16.78	0-360	103	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0076 AF (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	* ** 18.09	48.39	Pk	32.4	-40.8	0	39.99	54	-14.01	74	-34.01	0-360	249	H
2	* ** 22.855	48.55	Pk	33.7	-40.8	0	41.45	54	-12.55	74	-32.55	0-360	102	H
3	24.885	47.81	Pk	34.4	-40	0	42.21	54	-11.79	74	-31.79	0-360	249	H
4	* ** 18.038	48.93	Pk	32.5	-40.5	0	40.93	54	-13.07	74	-33.07	0-360	299	V
5	* ** 22.165	48.73	Pk	33.6	-40.9	0	41.43	54	-12.57	74	-32.57	0-360	299	V
6	* ** 23.633	48.6	Pk	33.9	-40.5	0	42	54	-12	74	-32	0-360	252	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 [*]	56 to 46 [*]
0.5-5	56	46
5-30	60	50

^{*} Decreases with the logarithm of the frequency.

TEST PROCEDURE

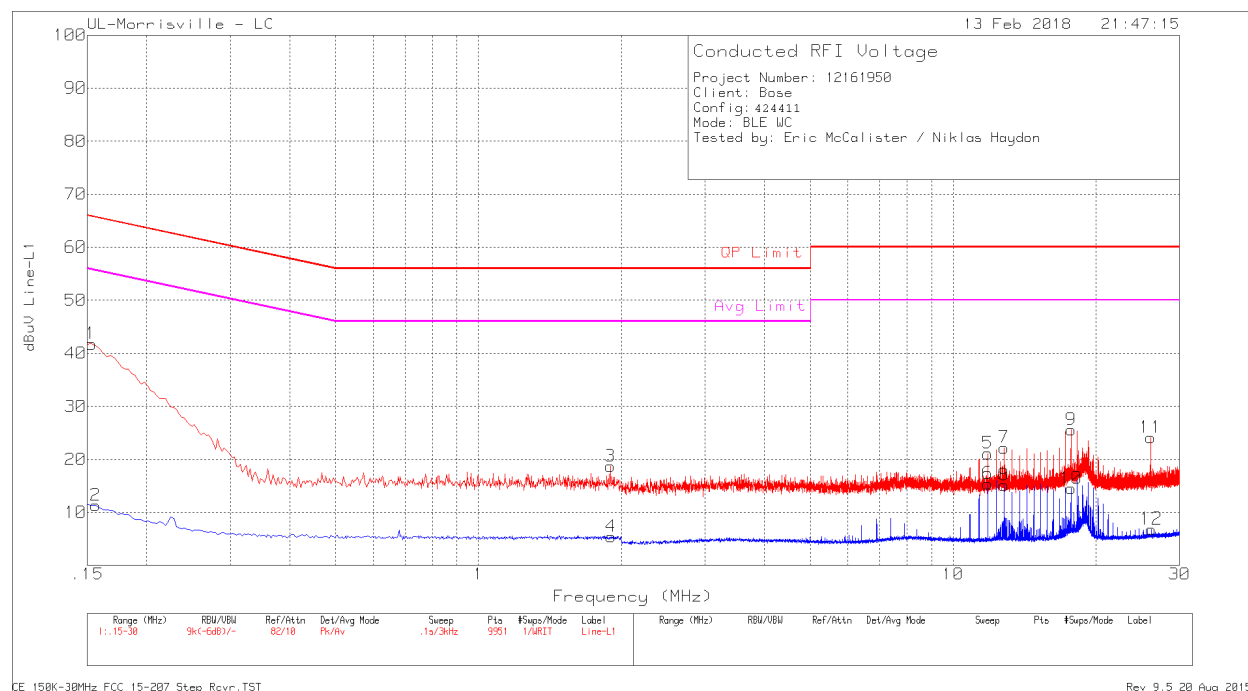
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both lines.

Note – Performed Line Conducted in the event model 424411 can be powered by AC Mains. Currently, 424411 is intended for aviation uses.

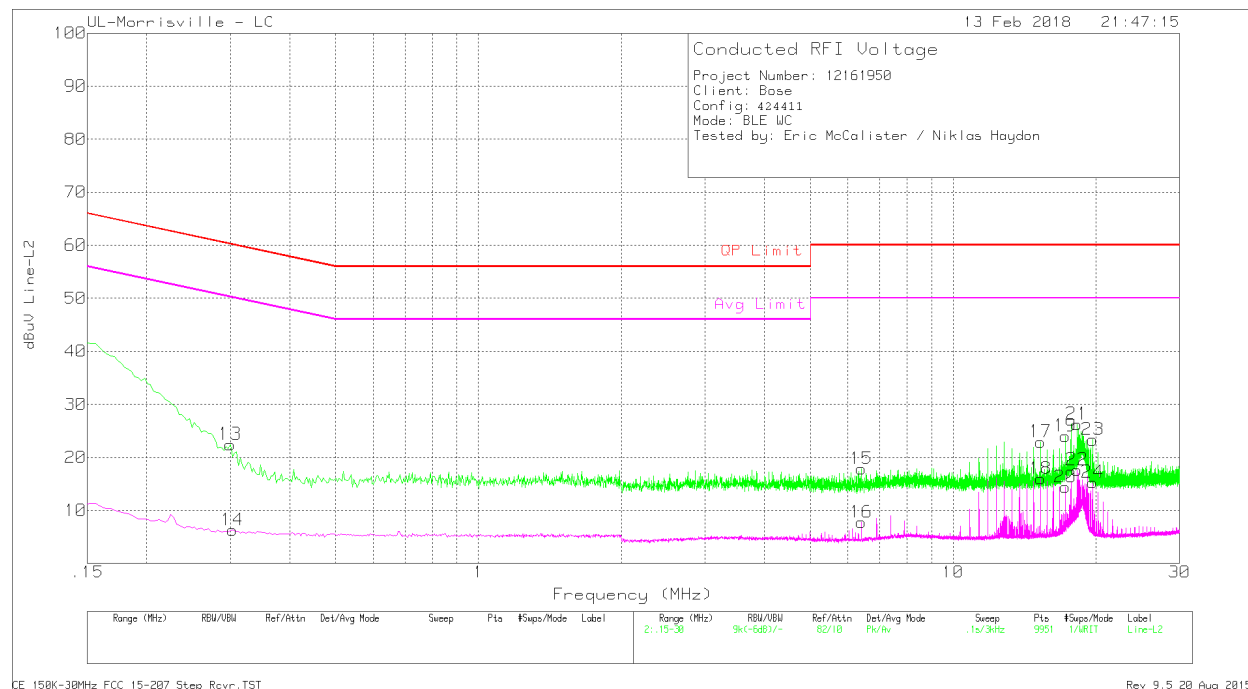
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit	Margin (dB)	Avg Limit	Margin (dB)
1	.153	31.56	Pk	.2	10	41.76	65.84	-24.08	-	-
2	.156	1.12	Av	.2	10	11.32	-	-	55.67	-44.35
3	1.899	8.73	Pk	0	10	18.73	56	-37.27	-	-
4	1.905	-4.59	Av	0	10	5.41	-	-	46	-40.59
5	11.829	10.91	Pk	.1	10.1	21.11	60	-38.89	-	-
6	11.829	5.23	Av	.1	10.1	15.43	-	-	50	-34.57
7	12.816	12.01	Pk	.1	10.1	22.21	60	-37.79	-	-
8	12.816	4.97	Av	.1	10.1	15.17	-	-	50	-34.83
9	17.748	15.3	Pk	.1	10.2	25.6	60	-34.4	-	-
10	17.748	4.25	Av	.1	10.2	14.55	-	-	50	-35.45
11	26.049	13.52	Pk	.3	10.3	24.12	60	-35.88	-	-
12	26.13	-3.77	Av	.3	10.3	6.83	-	-	50	-43.17

Pk - Peak detector
Av - Average detection

LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit	Margin (dB)	Avg Limit	Margin (dB)
13	.3	12.44	Pk	.1	9.9	22.44	60.24	-37.8	-	-
14	.303	-3.73	Av	.1	9.9	6.27	-	-	50.16	-43.89
15	6.402	7.72	Pk	.1	10	17.82	60	-42.18	-	-
16	6.408	-2.35	Av	.1	10	7.75	-	-	50	-42.25
17	15.27	12.73	Pk	.1	10.1	22.93	60	-37.07	-	-
18	15.27	5.78	Av	.1	10.1	15.98	-	-	50	-34.02
19	17.238	13.74	Pk	.1	10.2	24.04	60	-35.96	-	-
20	17.238	4.13	Av	.1	10.2	14.43	-	-	50	-35.57
21	18.246	15.94	Pk	.1	10.2	26.24	60	-33.76	-	-
22	18.243	7.34	Av	.1	10.2	17.64	-	-	50	-32.36
23	19.701	13.03	Pk	.1	10.2	23.33	60	-36.67	-	-
24	19.701	5	Av	.1	10.2	15.3	-	-	50	-34.7

Pk - Peak detector
Av - Average detection