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

BLUETOOTH LOW ENERGY CERTIFICATION TEST REPORT

FOR

BLUETOOTH SPEAKER

MODEL NUMBER: A1680

FCC ID: BCG-A1680

IC: 579C-A1680

REPORT NUMBER: 15U20341-E1V3

ISSUE DATE: SEPTEMBER 25, 2015

Prepared for
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	09/10/2015	Initial Issue	M. Mekuria
V2	09/15/2015	Updated Section 6	T. Chu
V3	09/25/2015	Updated EUT name on cover page and Section 1&5.1	T. Chu

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE, INC.
1 INFINITE LOOP
CUPERTINO, CA 95014, U.S.A.

EUT DESCRIPTION: BLUETOOTH SPEAKER

MODEL: A1680

SERIAL NUMBER: CC2Q607SGN1V (Conducted); CC2Q709VGN20 (Radiated)

DATE TESTED: MARCH 24 TO AUGUST 28, 2015

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

UL Verification Services Inc. 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 Verification Services Inc. By:

MENGISTU MEKURIA
SENIOR ENGINEER
UL VERIFICATION SERVICES INC.

Tested By:

JINGANG LI
EMC ENGINEER
UL VERIFICATION SERVICES INC.

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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, and RSS-247 Issue 1.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
☐ Chamber A	☒ Chamber D
☐ Chamber B	☐ Chamber E
☐ Chamber C	☐ Chamber F
	☐ Chamber G
	☐ Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

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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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	± 3.52 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.94 dB
Radiated Disturbance, 1 to 6 GHz	± 3.86 dB
Radiated Disturbance, 6 to 18 GHz	± 4.23 dB
Radiated Disturbance, 18 to 26 GHz	± 5.30 dB
Radiated Disturbance, 26 to 40 GHz	± 5.23 dB

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 a Portable Bluetooth speaker.

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	BLE	8.20	6.61

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Gain
2.4	1.00

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 2.00.162. The test utility software used during testing was CSR BlueTest3, Ver 2.5.8.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission 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 X (Flatbed) orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in X orientation.

Worst-case data rate was:

BLE: 1 Mbps.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop AC/DC adapter	Lenovo	92P1160	11S92P1160Z1ZBGH798B12	NA
Laptop	Lenovo	7659	L3-AL664 08/03	NA

I/O CABLES (CONDUCTED TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Antenna	1	SMA	Un-Shielded	0.2	To spectrum Analyzer
2	USB	1	USB	Shielded	1	N/A
3	AC	1	AC	Un-shielded	2	N/A

I/O CABLES (RADIATED ABOVE 1 GHZ)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
None Used						

I/O CABLES (RADAITED BELOW 1 GHZ)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Audio	1	Earphone	Un-shielded	1	N/A
2	AC	1	AC/DC Adappter	Un-shielded	2	N/A

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I/O CABLES (AC LINE CONDUCTED: AC/DC ADAPTER)

Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Audio	1	Earphone	Un-shielded	1	N/A
2	AC	1	AC/DC Adapter	Un-shielded	2	N/A

I/O CABLES (AC LINE CONDUCTED: LAPTOP CONFIGUARTION)

Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Audio	1	Earphone	Un-shielded	1	N/A
2	USB	1	USB	Un-shielded	1	N/A
3	AC	1	AC/DC Adapter	Un-shielded	2	N/A

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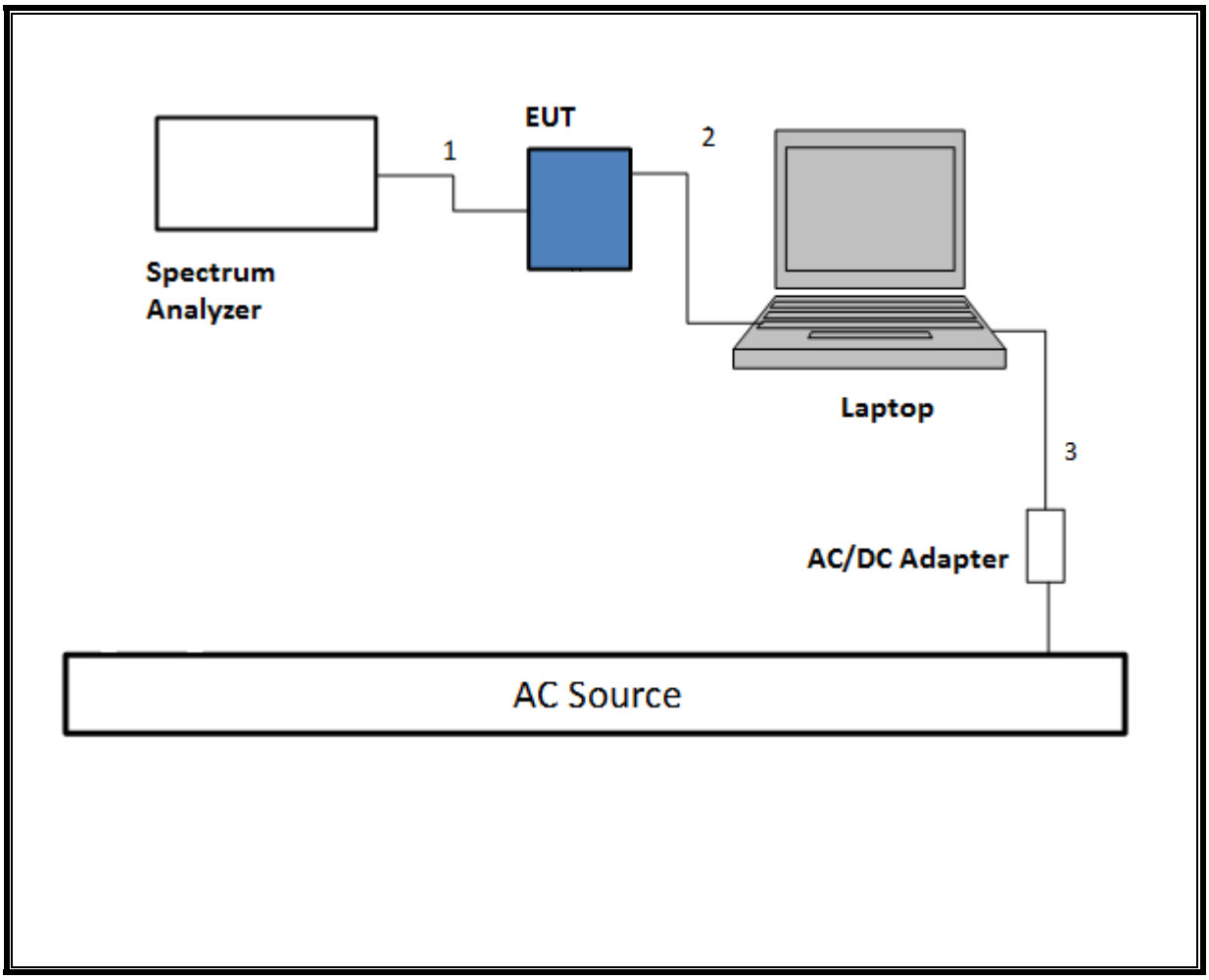
TEST SETUP – CONDUCTED PORT

The EUT was tested connected to a host Laptop via USB cable adapter and spectrum analyzer to antenna port. Test software exercised the EUT.

SETUP DIAGRAM



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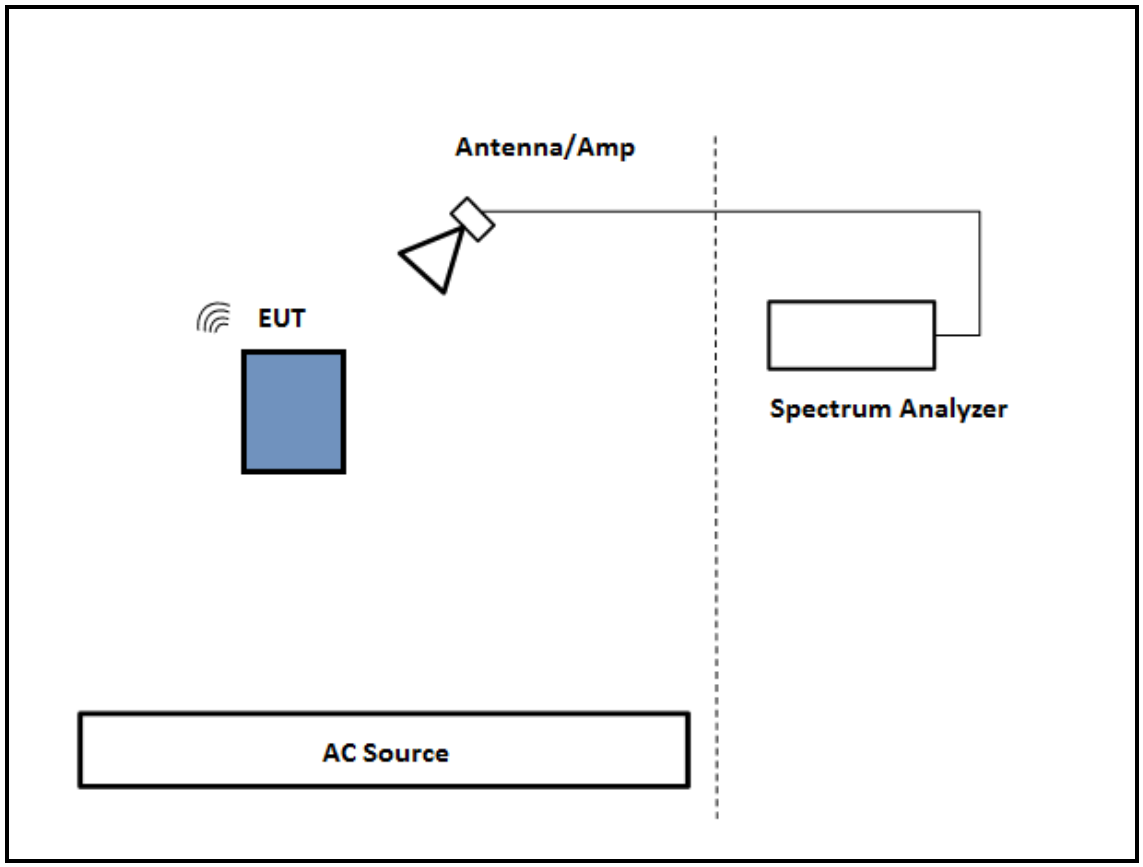
TEST SETUP- RADIATED-ABOVE 1 GHZ

The EUT was powered by AC cord. Test software exercised the EUT.

SETUP DIAGRAM



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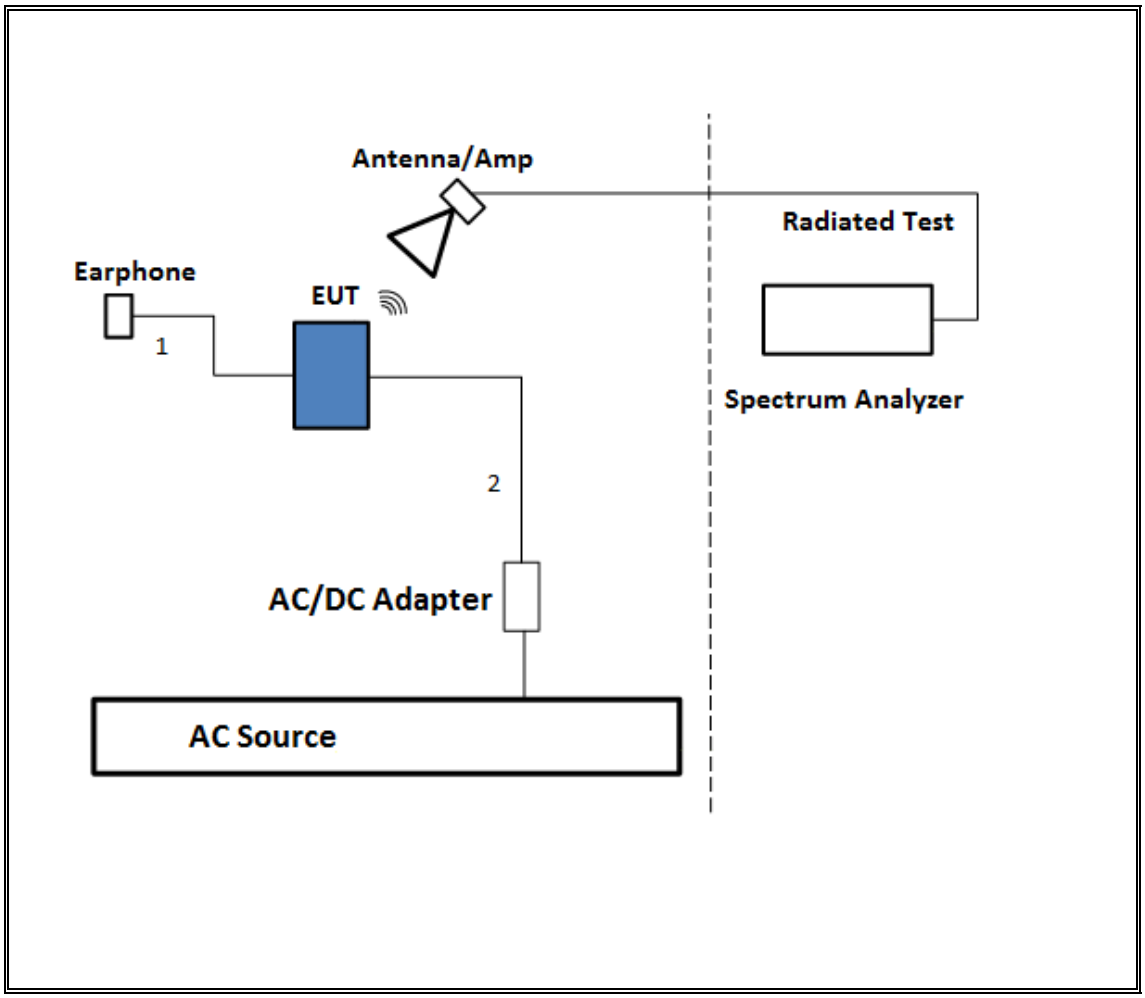
TEST SETUP- BELOW 1GHz

The EUT was tested with earphone connected and powered by AC adapter. Test software exercised the EUT.

SETUP DIAGRAM



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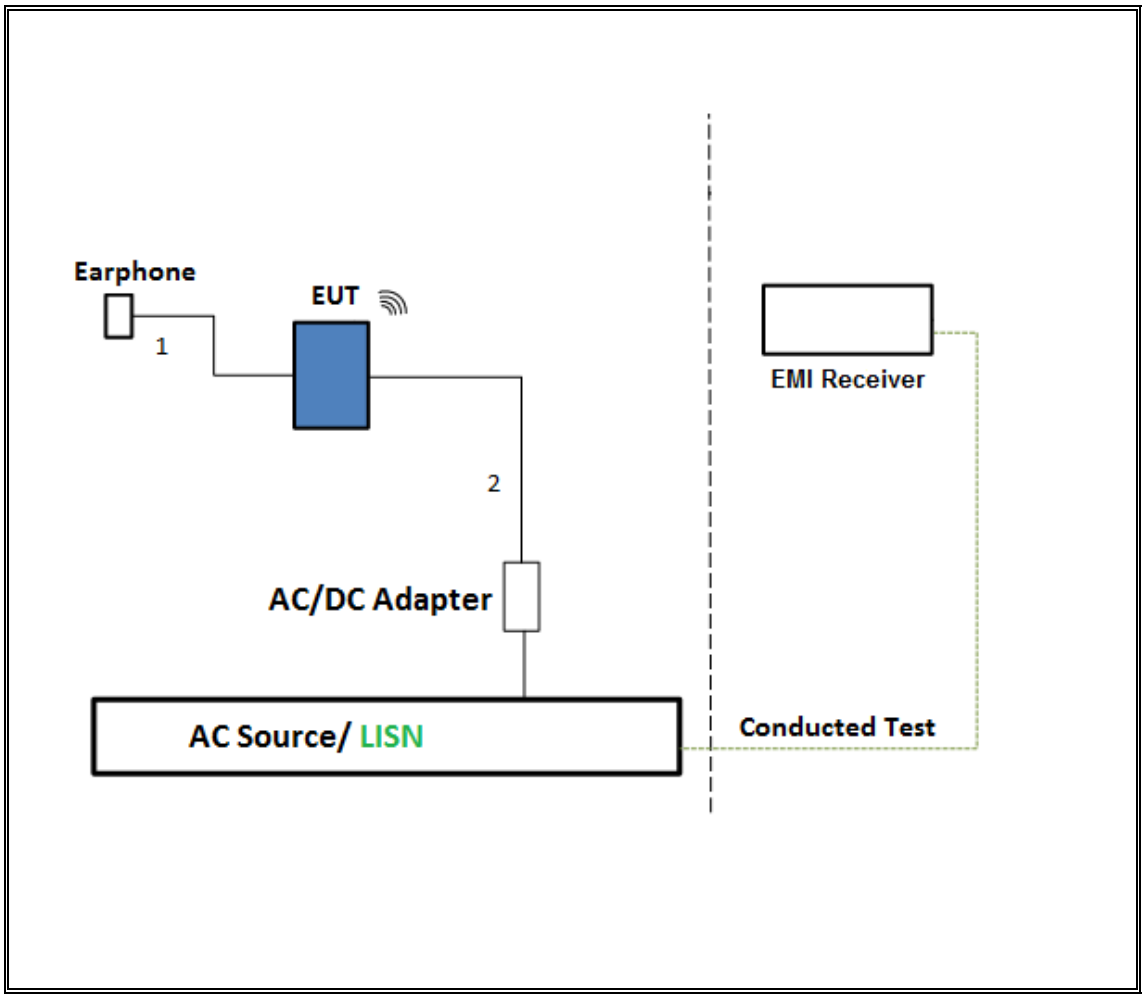
TEST SETUP- AC LINE CONDUCTED: AC/DC ADAPTER

The EUT was tested with earphone connected and powered by AC/DC adapter via USB cable. Test software exercised the EUT.

SETUP DIAGRAM



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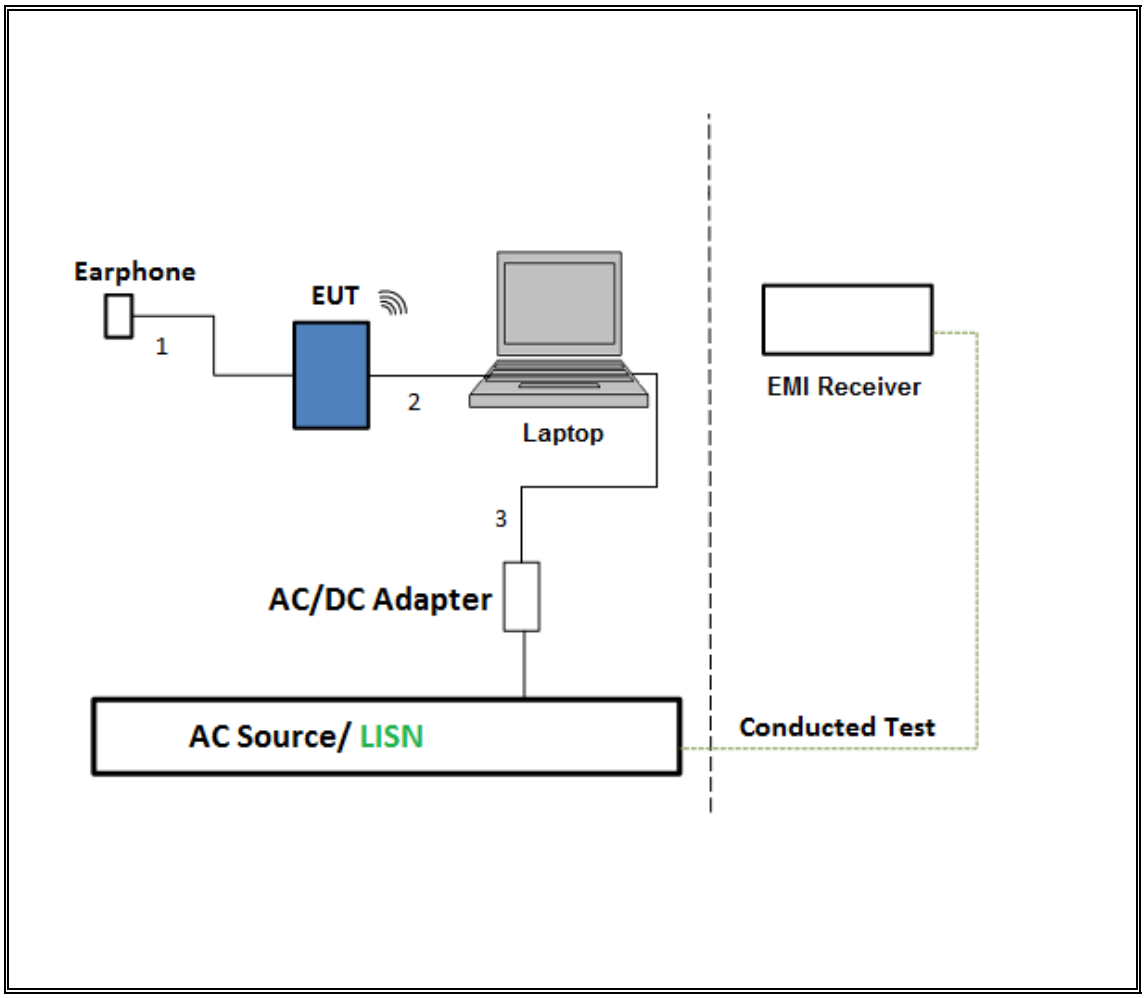
TEST SETUP- AC LINE CONDUCTED: LAPTOP CONFIGURATION

The EUT was tested with earphone connected and powered by host PC via USB cable. Test software exercised the EUT.

SETUP DIAGRAM



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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 List				
Description	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
Antenna, Horn 1-18GHz	ETS Lindgren	3117	2/10/2015	2/10/2016
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	1/14/2015	1/14/2016
Amplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	4/25/2015	4/25/2016
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB1	2/13/2015	2/13/2016
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	6/9/2015	6/9/2016
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	2/20/2015	2/20/2016
Power Meter, P-series single channel	Keysight	N1911A	4/7/2015	4/7/2016
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight	N1921A	7/12/2015	7/12/2016
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826	12/17/2014	12/17/2015
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Keysight	8449B	4/13/2015	4/13/2016
AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ECSI7	09/16/14	09/16/15
LISN for Conducted Emissions CISPR-16	FCC	50/250-25-2	01/16/15	01/16/16
Power Cable, Line Conducted Emissions ANSI 63.4	U L	PG1	7/28/2015	7/28/2016
UL SOFTWARE				
* Radiated Software	UL	UL EMC	Ver 9.5, July 22, 2014	
* Conducted Software	UL	UL EMC	Ver 2.2, March 31, 2015	
* AC Line Conducted Software	UL	UL EMC	Ver 9.5, April 3, 2015	

Note: * indicates automation software version used in the compliance certification testing

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7. ANTENNA PORT TEST RESULTS

7.1. MEASUREMENT METHODS

MEASUREMENT METHODS

6 dB BW: KDB 558074 D01 v03r03, Section 8.1.

Output Power: KDB 558074 D01 v03r03, Section 9.1.2.

Power Spectral Density: KDB 558074 D01 v03r03, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r03, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r03, Section 12.1.

Band-edge: KDB 558074 D01 v03r03, Section 12.1

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7.2. ON TIME, 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)
BLE	0.394	0.648	0.608	60.80%	2.16	2.538

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DUTY CYCLE PLOTS

DUTY CYCLE BLE MODE

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7.3. 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	2402	0.697	0.5
Middle	2440	0.707	0.5
High	2480	0.713	0.5

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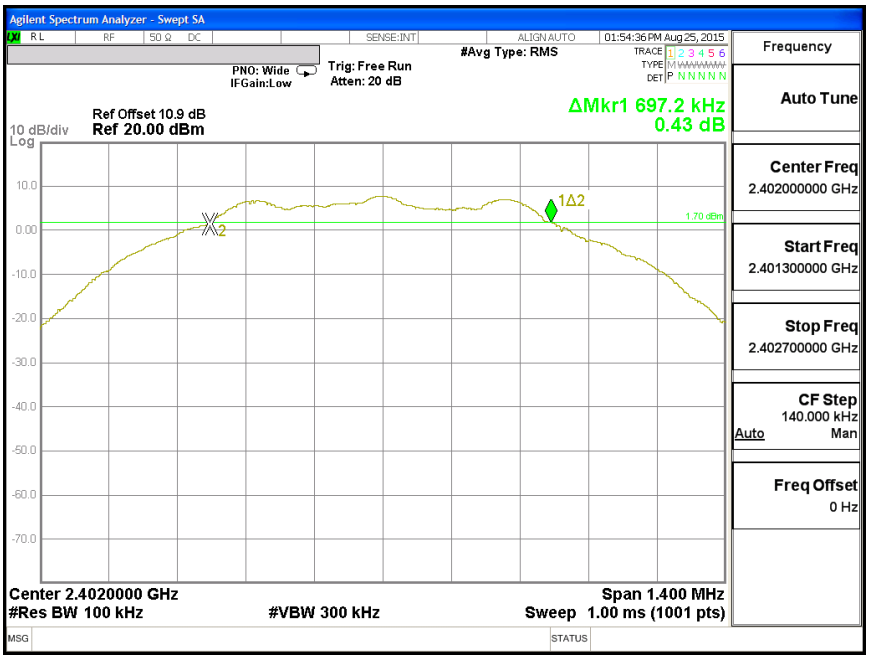
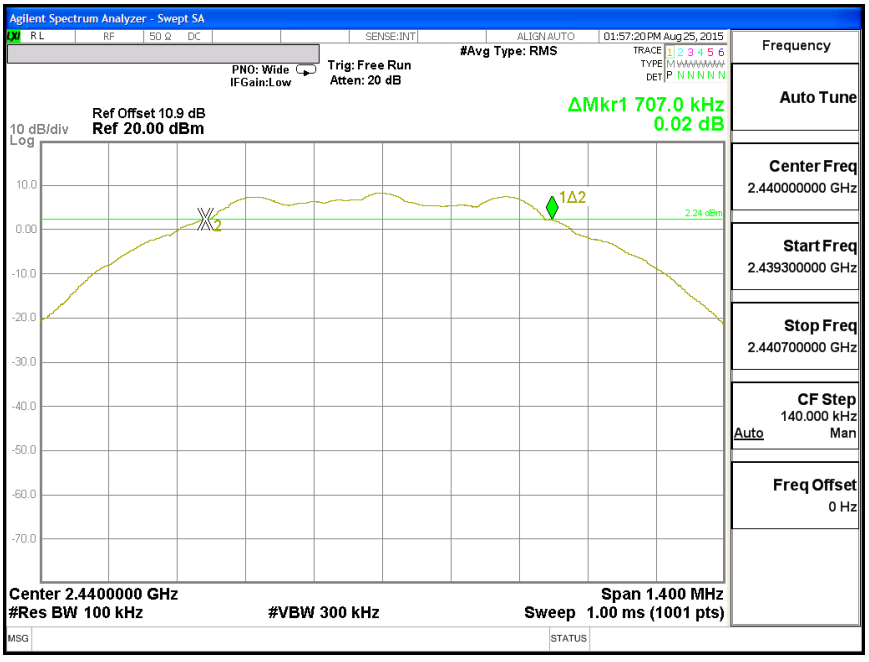
6 dB BANDWIDTH

6 dB BANDWIDTH LOW CH



6 dB BANDWIDTH MID CH



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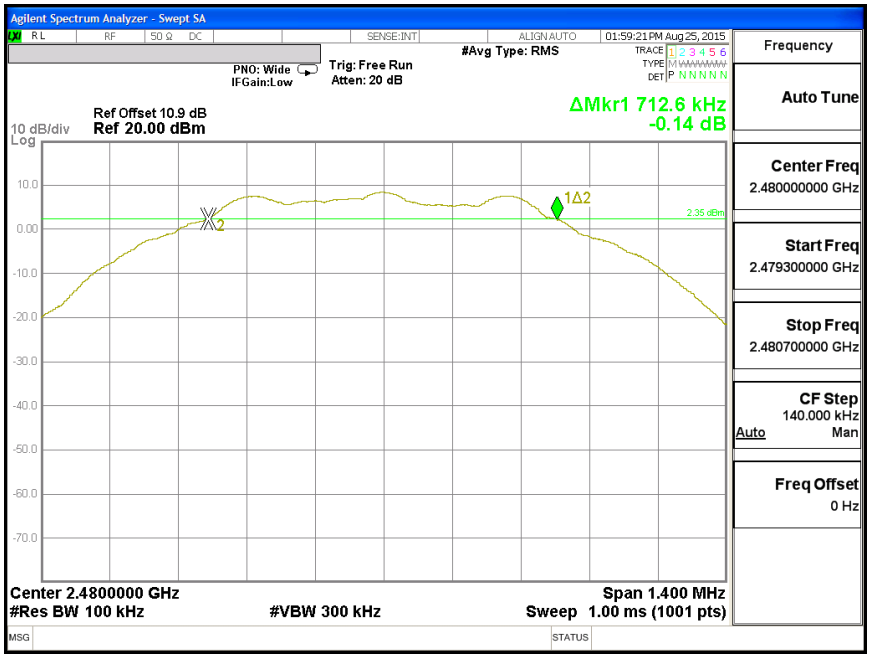
6 dB BANDWIDTH HIGH CH



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7.4. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% 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	0.9877
Middle	2440	1.0994
High	2480	0.9958

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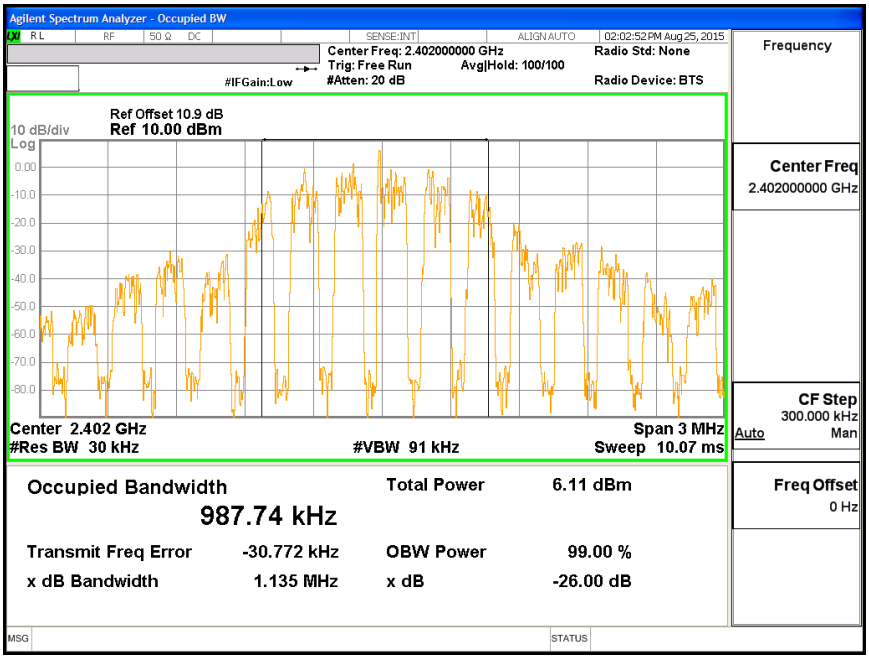
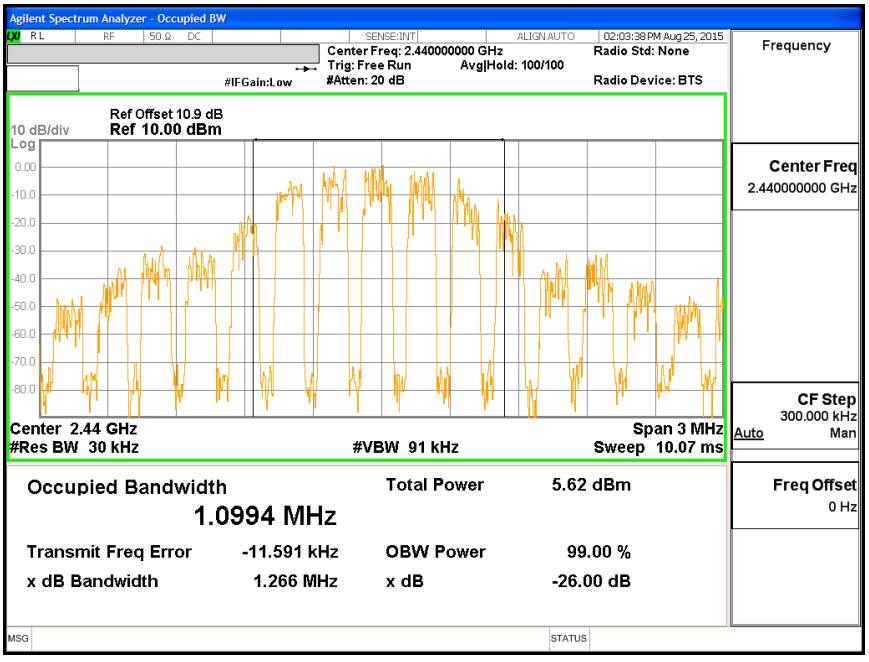
99% BANDWIDTH

99% BANDWIDTH LOW CH



99% BANDWIDTH MID CH



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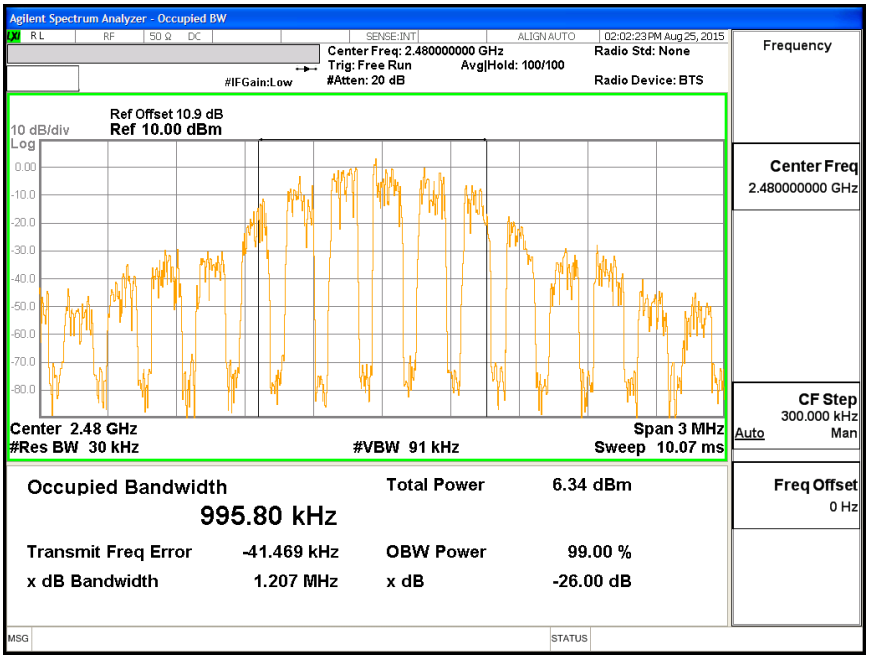
99% BANDWIDTH HIGH CH



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7.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 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	7.31
Middle	2440	7.87
High	2480	8.00

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7.6. 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	2402	7.56	30	-22.440
Middle	2440	8.10	30	-21.900
High	2480	8.20	30	-21.800

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7.7. 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	2402	-7.58	8	-15.58
Middle	2440	-7.19	8	-15.19
High	2480	-6.85	8	-14.85

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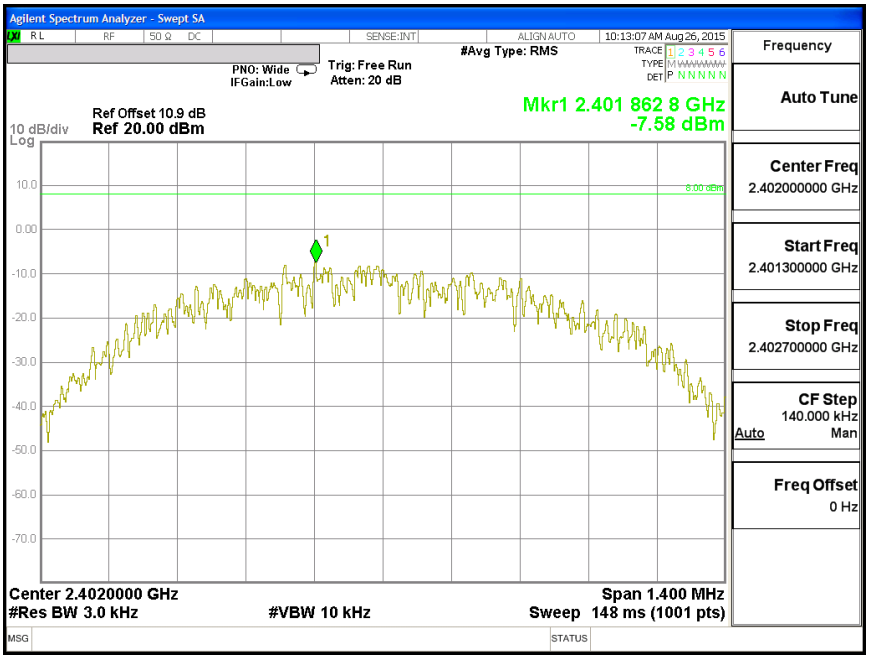
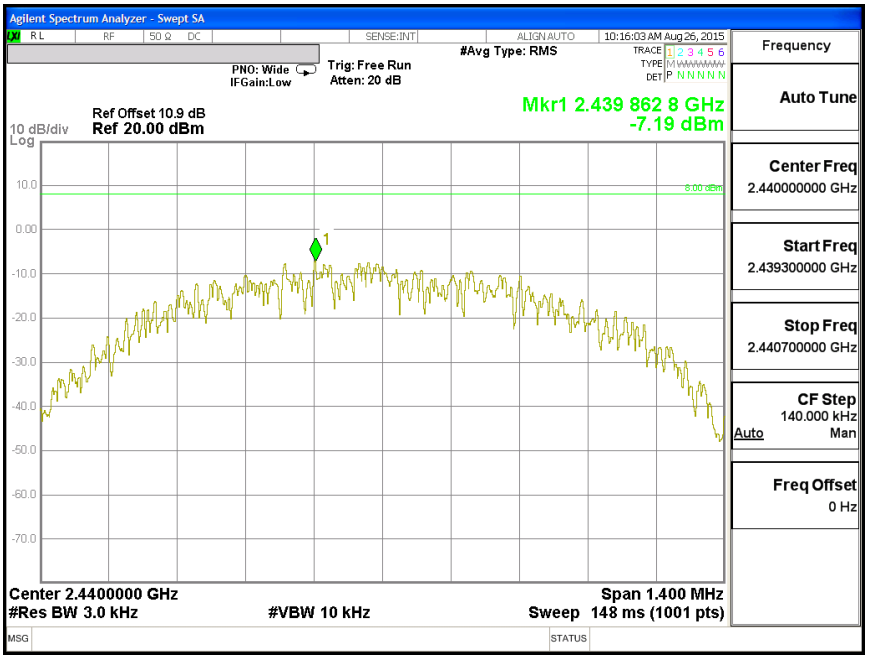
POWER SPECTRAL DENSITY

PSD LOW CH



PSD MID CH



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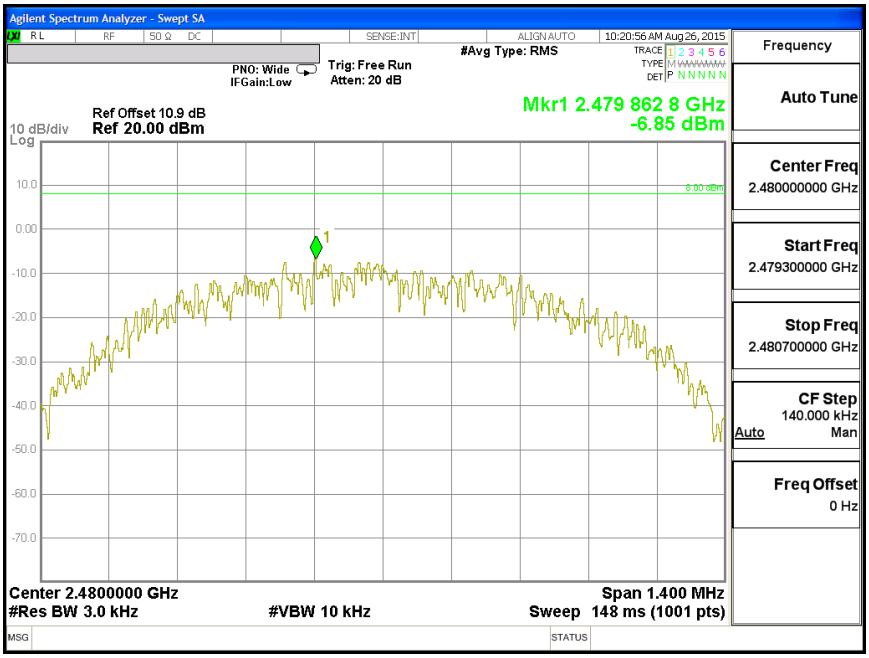
PSD HIGH CH



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7.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

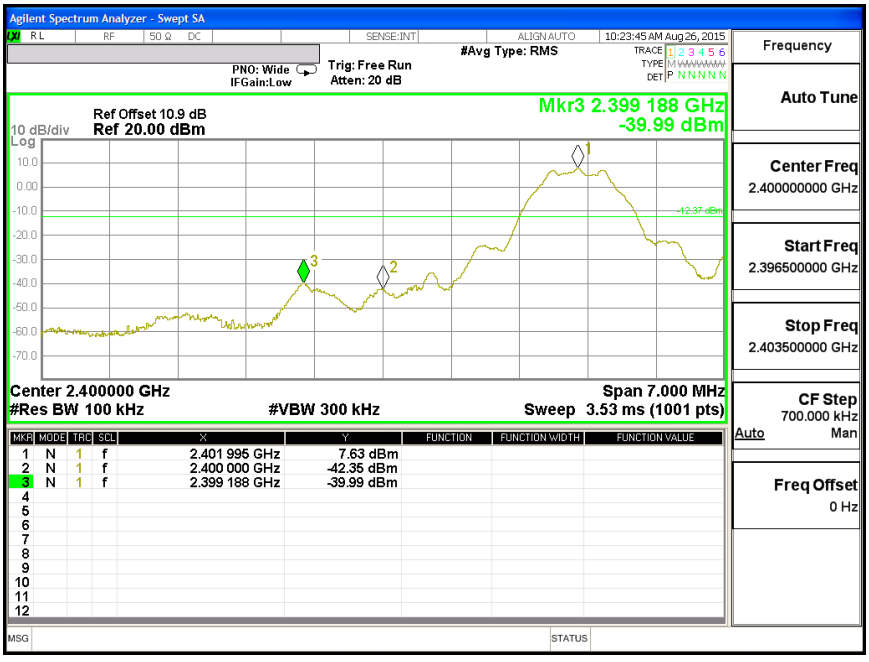
IC RSS-247 (5.5)

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

RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CH BANDEDGE



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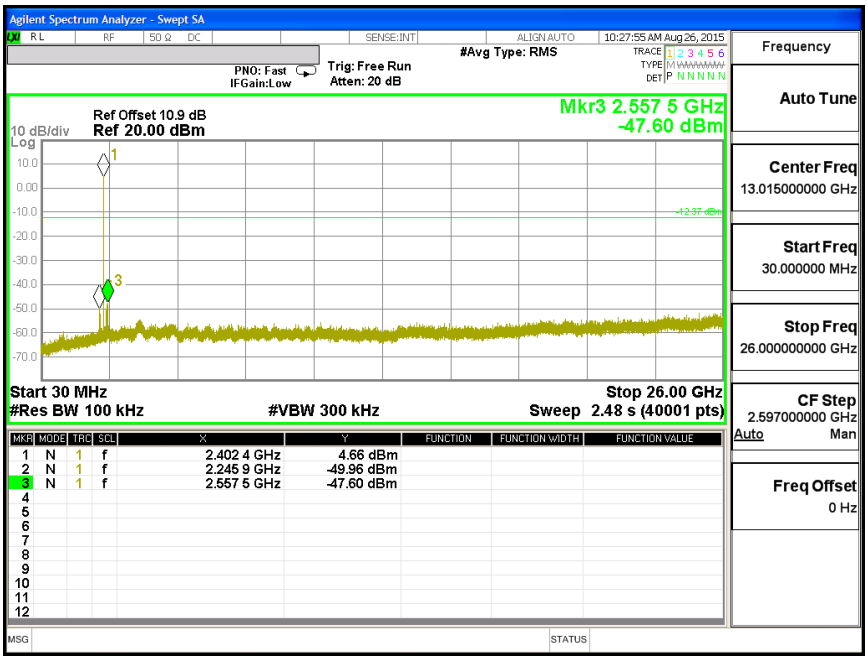
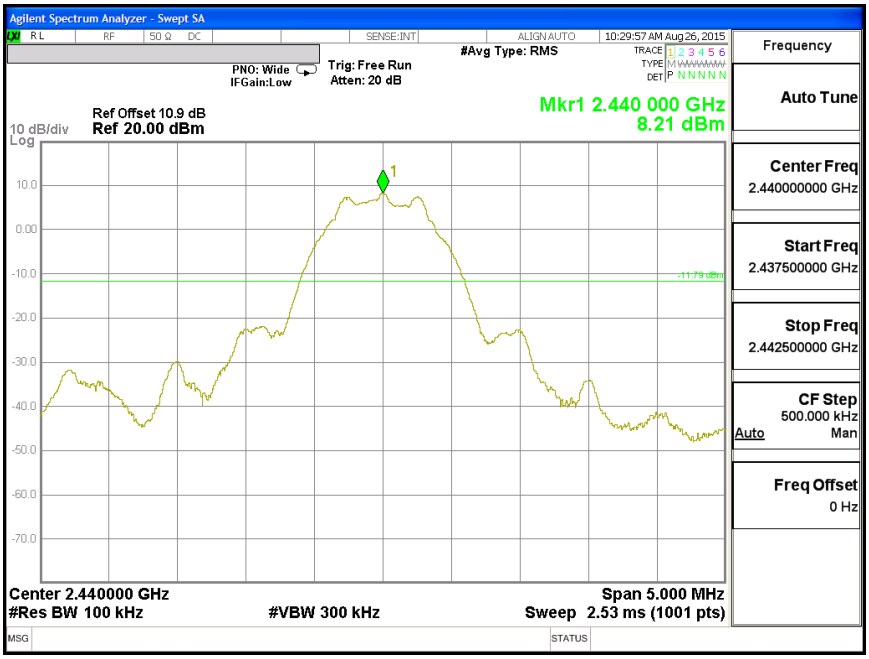
LOW CH SPURIOUS



SPURIOUS EMISSIONS, MID CHANNEL

MID CH REFERENCE



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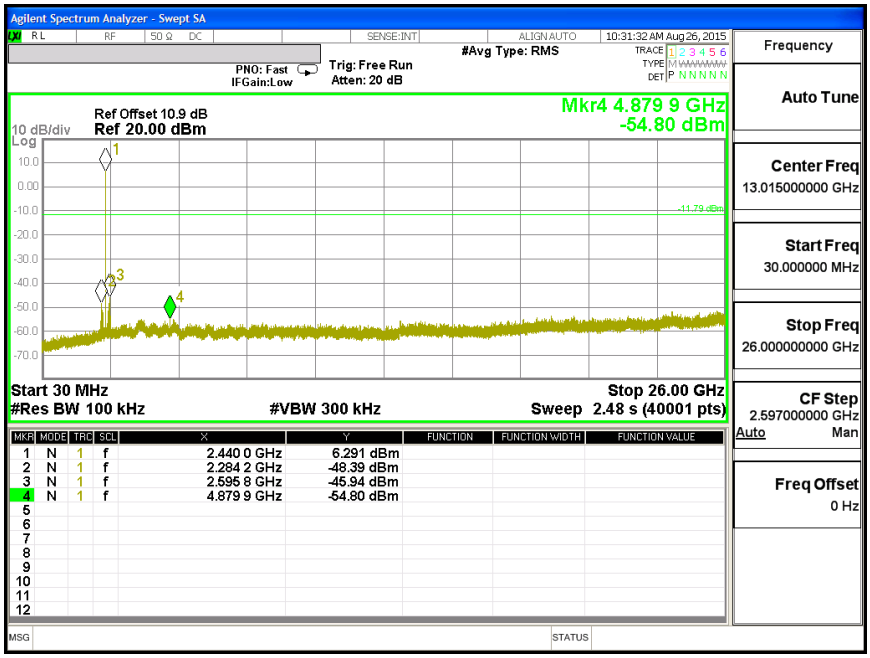
MID CH SPURIOUS



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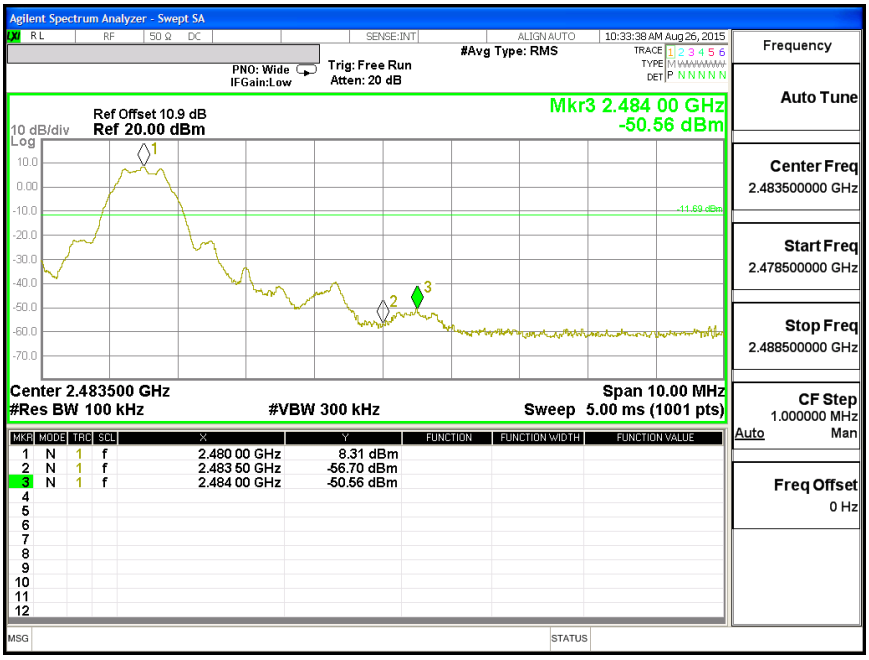
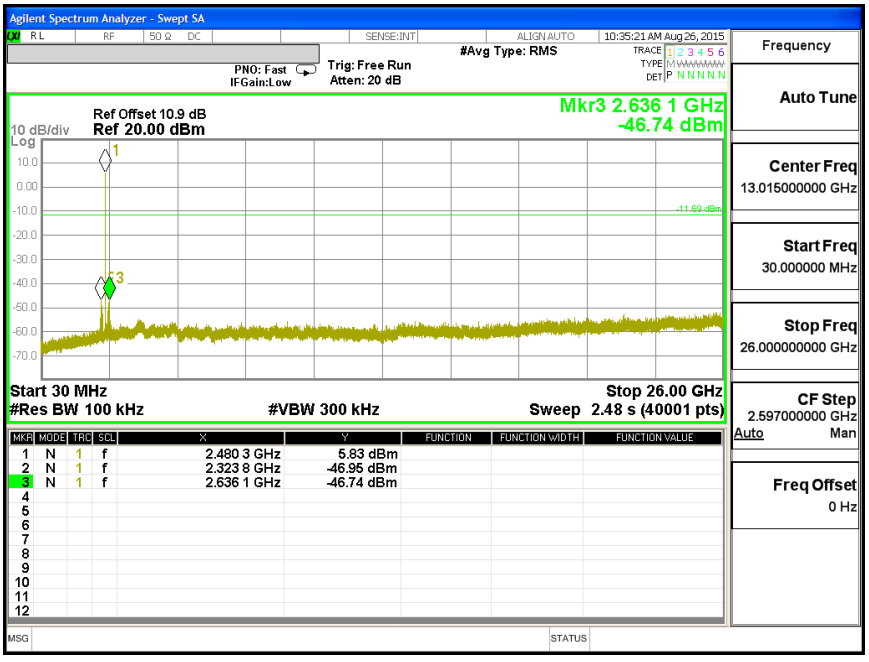
SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CH BANDEDGE



HIGH CH SPURIOUS



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8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
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 measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 3MHz video bandwidth with average detector for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz 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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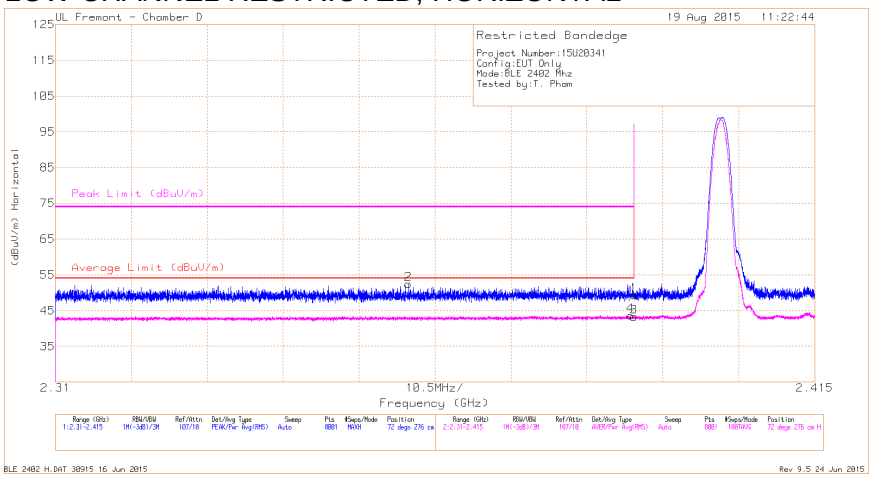
8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. RESTRICTED BANDEDGE

LOW CHANNEL RESTRICTED, HORIZONTAL



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Flt r/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
2	* 2.359	41.34	Pk	32	-20.9	0	52.44	-	-	74	-21.56	72	276	H
1	* 2.39	37.94	Pk	32.1	-20.7	0	49.34	-	-	74	-24.66	72	276	H
3	* 2.39	29.69	RMS	32.1	-20.7	2.16	43.25	54	-10.75	-	-	72	276	H
4	* 2.39	30.06	RMS	32.1	-20.7	2.16	43.62	54	-10.38	-	-	72	276	H

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

RMS - RMS detection

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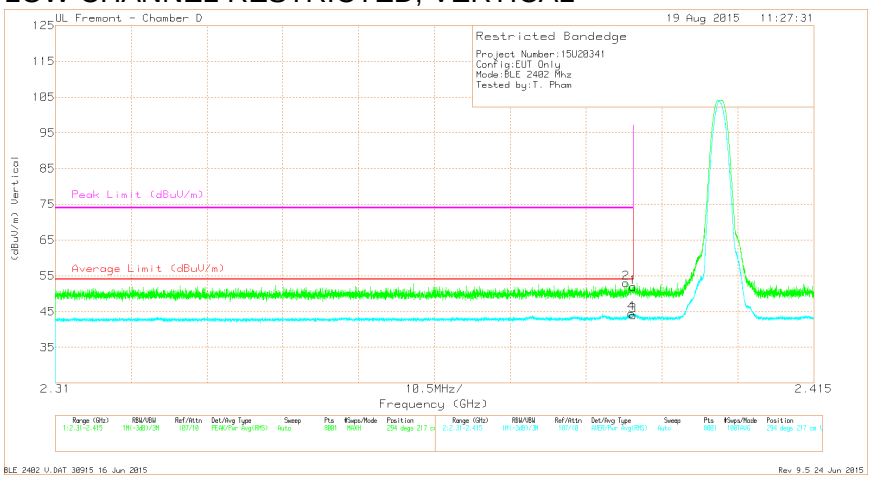
LOW CHANNEL RESTRICTED, VERTICAL



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Flt r/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
2	* 2.389	41.59	Pk	32.1	-20.7	0	52.99	-	-	74	-21.01	294	217	V
1	* 2.39	40.5	Pk	32.1	-20.7	0	51.9	-	-	74	-22.1	294	217	V
3	* 2.39	30.41	RMS	32.1	-20.7	2.16	43.97	54	-10.03	-	-	294	217	V
4	* 2.39	30.93	RMS	32.1	-20.7	2.16	44.49	54	-9.51	-	-	294	217	V

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

RMS - RMS detection

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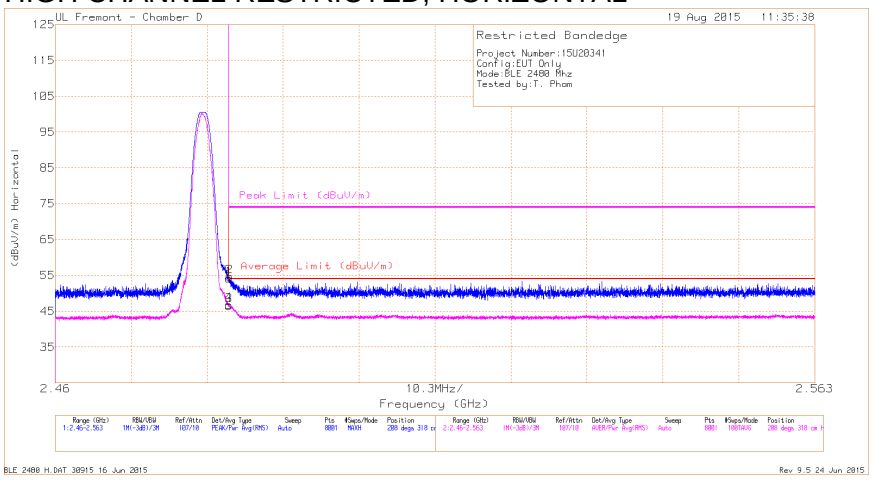
HIGH CHANNEL RESTRICTED, HORIZONTAL



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (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	42.75	Pk	32.2	-20.8	0	54.15	-	-	74	-19.85	208	318	H
2	* 2.484	43.24	Pk	32.2	-20.8	0	54.64	-	-	74	-19.36	208	318	H
3	* 2.484	33.05	RMS	32.2	-20.8	2.16	46.61	54	-7.39	-	-	208	318	H
4	* 2.484	33.21	RMS	32.2	-20.8	2.16	46.77	54	-7.23	-	-	208	318	H

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

RMS - RMS detection

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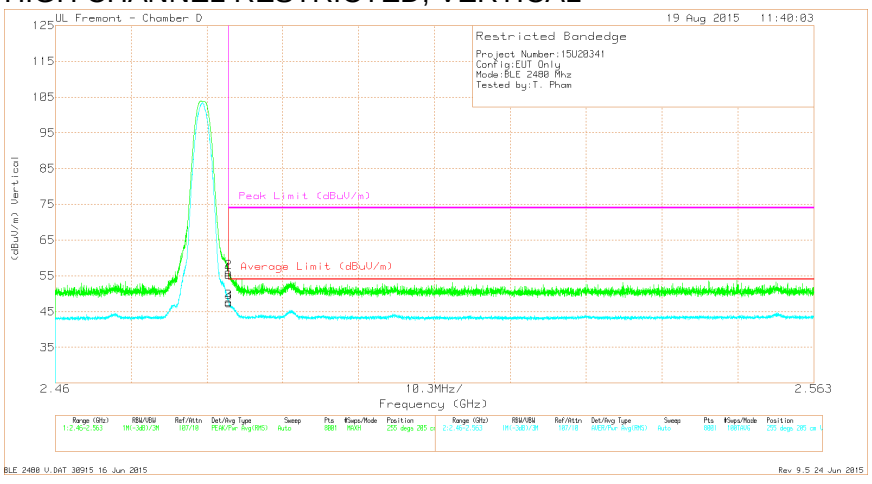
HIGH CHANNEL RESTRICTED, VERTICAL



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (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	43.86	Pk	32.2	-20.8	0	55.26	-	-	74	-18.74	255	205	V
2	* 2.484	44.63	Pk	32.2	-20.8	0	56.03	-	-	74	-17.97	255	205	V
3	* 2.484	34.11	RMS	32.2	-20.8	2.16	47.67	54	-6.33	-	-	255	205	V
4	* 2.484	33.79	RMS	32.2	-20.8	2.16	47.35	54	-6.65	-	-	255	205	V

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

RMS - RMS detection

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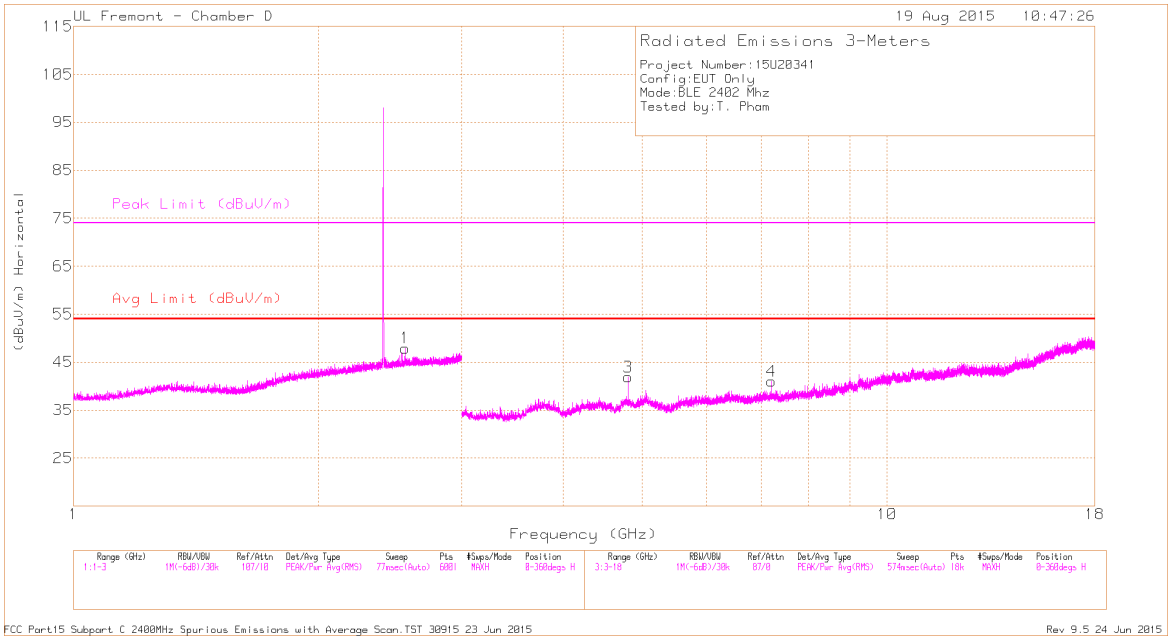
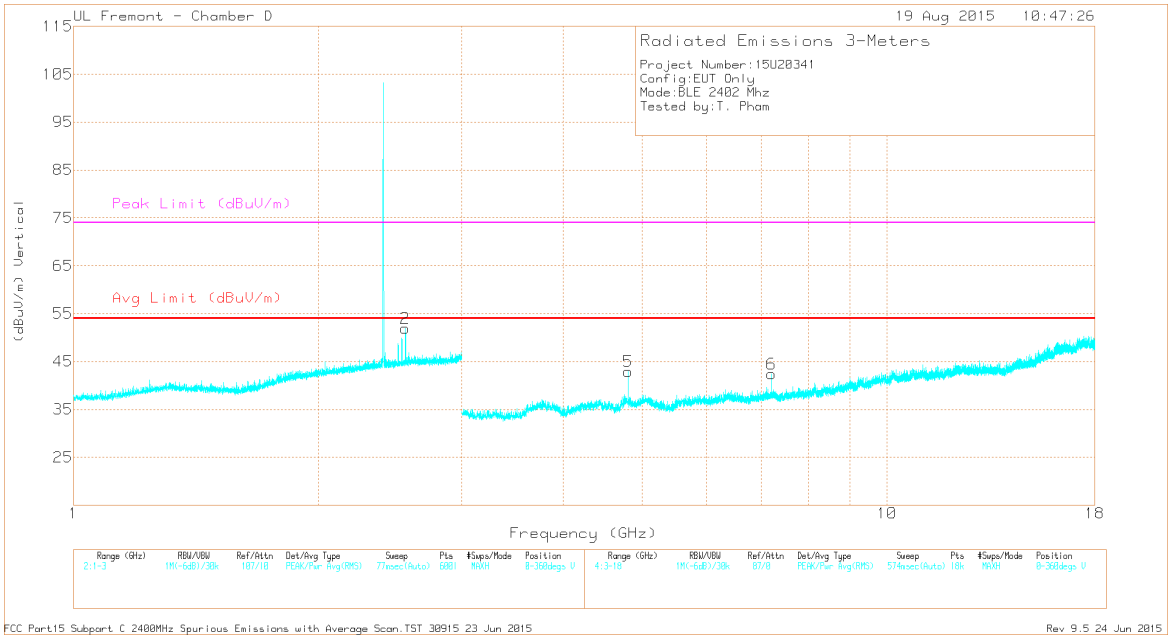
8.2.2. HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



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DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (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
3	* 4.804	40.71	PK2	34.1	-27	0	47.81	-	-	74	-26.19	129	107	H
	* 4.804	30.49	MAv1	34.1	-27	2.16	39.75	54	-14.25	-	-	129	107	H
5	* 4.804	42.6	PK2	34.1	-27	0	49.7	-	-	74	-24.3	59	169	V
	* 4.804	33.62	MAv1	34.1	-27	2.16	42.88	54	-11.12	-	-	59	169	V
1	2.558	44.29	PK2	32.3	-20.7	0	55.89	-	-	74	-18.11	116	248	H
	2.558	33.87	MAv1	32.3	-20.7	2.16	47.63	-	-	-	-	116	248	H
2	2.558	45.93	PK2	32.3	-20.7	0	57.53	-	-	74	-16.47	282	104	V
	2.558	37.78	MAv1	32.3	-20.7	2.16	51.54	-	-	-	-	282	104	V
6	7.205	39.88	PK2	35.4	-25.1	0	50.18	-	-	74	-23.82	48	201	V
	7.205	28.65	MAv1	35.4	-25.1	2.16	41.11	-	-	-	-	48	201	V
4	7.207	39.54	PK2	35.4	-25.1	0	49.84	-	-	74	-24.16	128	201	H
	7.205	28.13	MAv1	35.4	-25.1	2.16	40.59	-	-	-	-	128	201	H

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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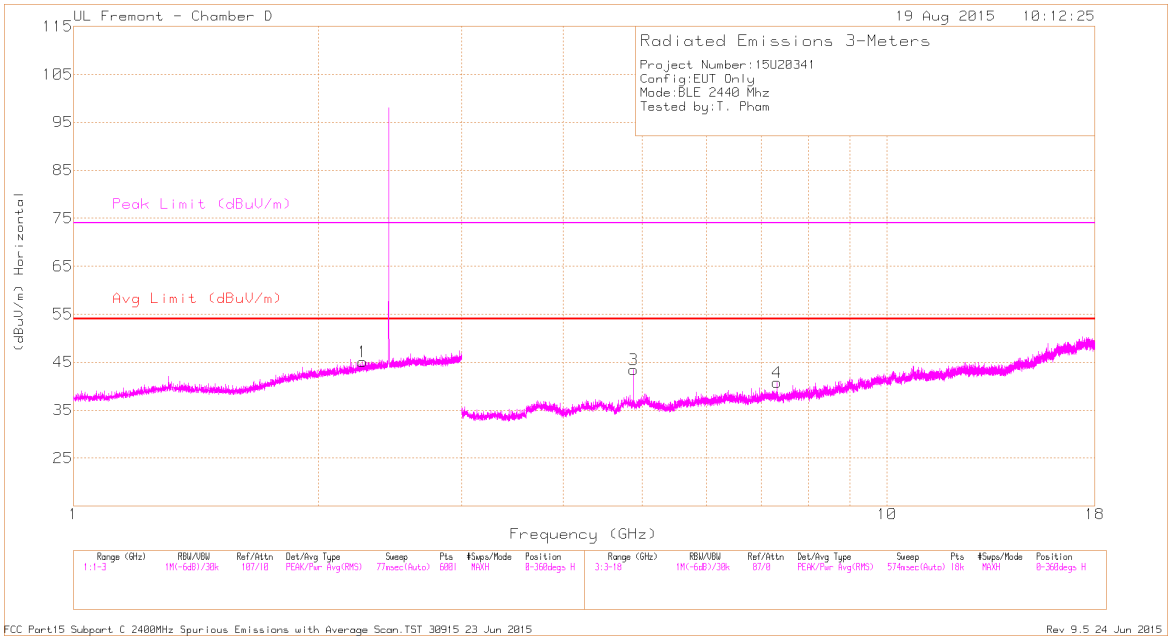
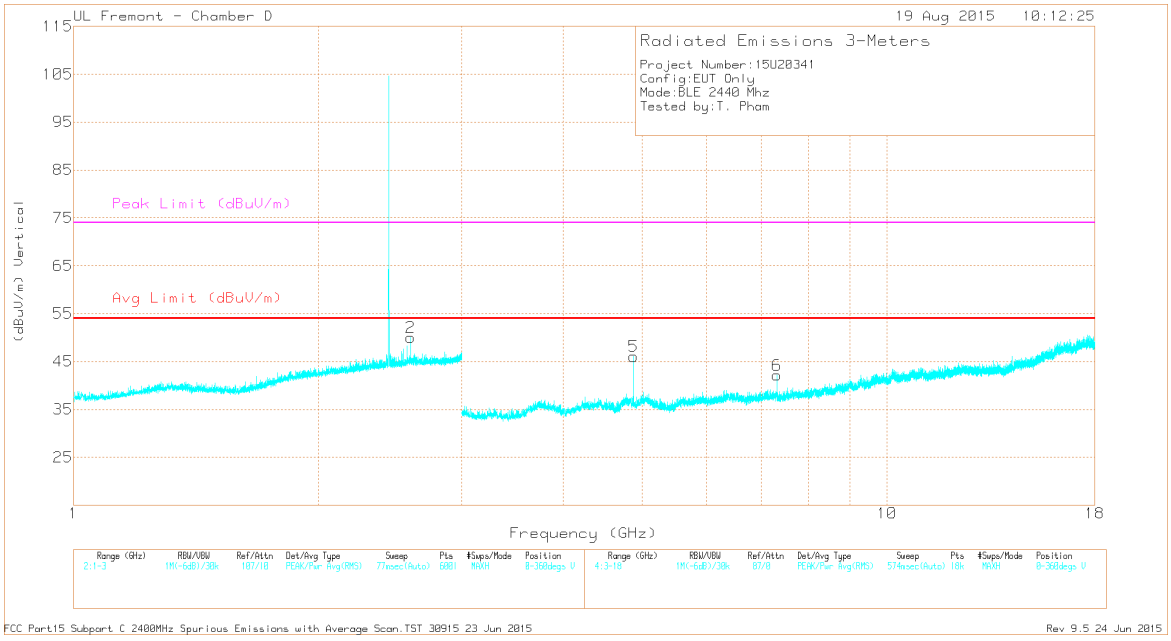
MID CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



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DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (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	* 2.264	41.58	PK2	31.8	-20.9	0	52.48	-	-	74	-21.52	39	120	H
	* 2.265	30.09	MAv1	31.8	-20.9	2.16	43.15	54	-10.85	-	-	39	120	H
3	* 4.881	42.26	PK2	34.1	-28.1	0	48.26	-	-	74	-25.74	33	341	H
	* 4.88	33.38	MAv1	34.1	-28.1	2.16	41.54	54	-12.46	-	-	33	341	H
4	* 7.319	39.34	PK2	35.5	-25.1	0	49.74	-	-	74	-24.26	220	266	H
	* 7.319	27.86	MAv1	35.5	-25.1	2.16	40.42	54	-13.58	-	-	220	266	H
5	* 4.88	43.95	PK2	34.1	-28.1	0	49.95	-	-	74	-24.05	323	186	V
	* 4.88	36.75	MAv1	34.1	-28.1	2.16	44.91	54	-9.09	-	-	323	186	V
6	* 7.319	39.17	PK2	35.5	-25.1	0	49.57	-	-	74	-24.43	338	129	V
	* 7.319	28.56	MAv1	35.5	-25.1	2.16	41.12	54	-12.88	-	-	338	129	V
2	2.596	44.83	PK2	32.4	-20.6	0	56.63	-	-	74	-17.37	183	105	V
	2.596	35.83	MAv1	32.4	-20.6	2.16	49.79	-	-	-	-	183	105	V

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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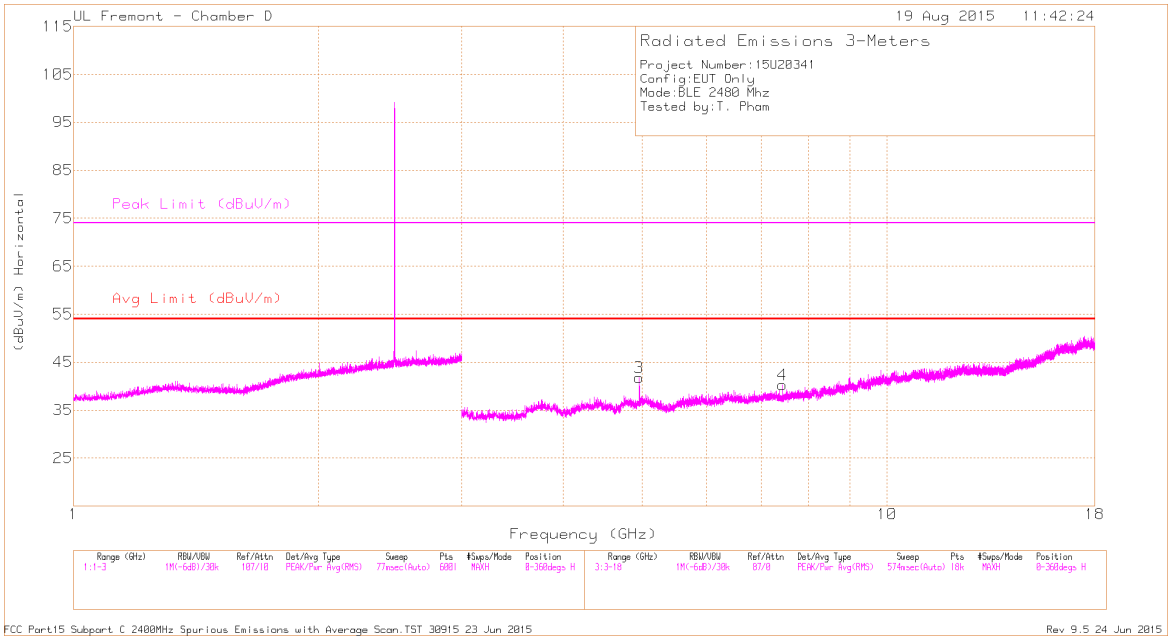
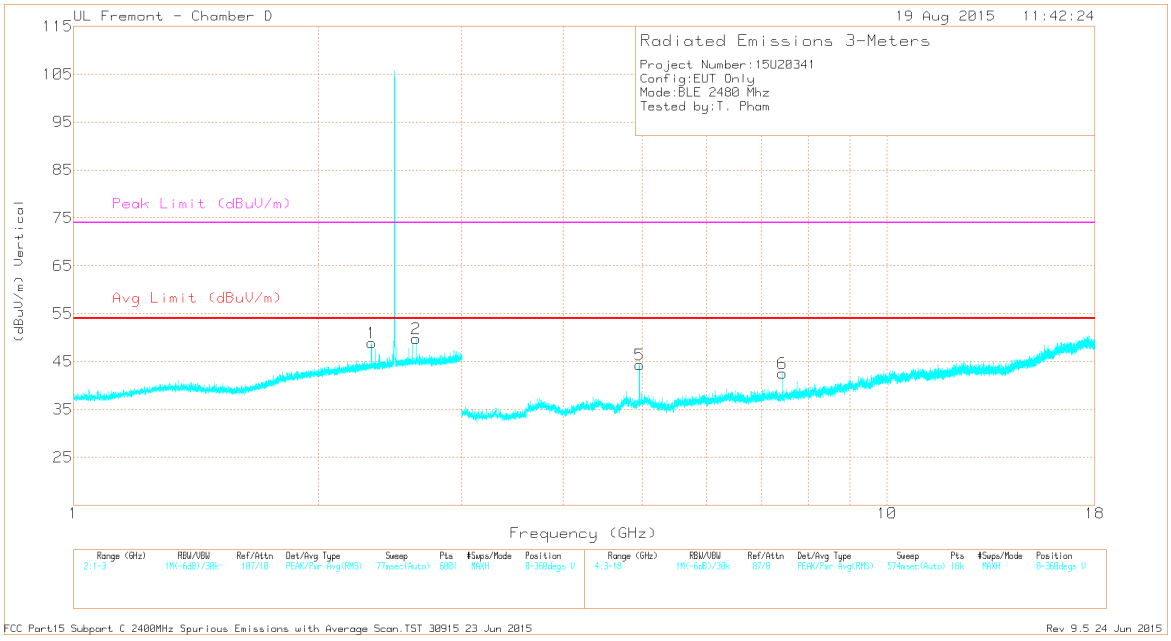
HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



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DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (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	* 2.324	44.72	PK2	32	-21	0	55.72	-	-	74	-18.28	199	202	V
	* 2.324	35.37	MAv1	32	-21	2.16	48.53	54	-5.47	-	-	199	202	V
3	* 4.959	41.37	PK2	34.2	-27.7	0	47.87	-	-	74	-26.13	39	103	H
	* 4.96	31.88	MAv1	34.2	-27.7	2.16	40.54	54	-13.46	-	-	39	103	H
4	* 7.44	37.34	PK2	35.5	-25	0	47.84	-	-	74	-26.16	115	124	H
	* 7.439	25.32	MAv1	35.5	-25	2.16	37.98	54	-16.02	-	-	115	124	H
5	* 4.961	42.71	PK2	34.2	-27.7	0	49.21	-	-	74	-24.79	335	147	V
	* 4.96	34.5	MAv1	34.2	-27.7	2.16	43.16	54	-10.84	-	-	335	147	V
6	* 7.44	39.37	PK2	35.5	-25	0	49.87	-	-	74	-24.13	316	365	V
	* 7.44	28.45	MAv1	35.5	-25	2.16	41.11	54	-12.89	-	-	316	365	V
2	2.636	44.86	PK2	32.4	-20.6	0	56.66	-	-	74	-17.34	86	124	V
	2.636	35.01	MAv1	32.4	-20.6	2.16	48.97	-	-	-	-	86	124	V

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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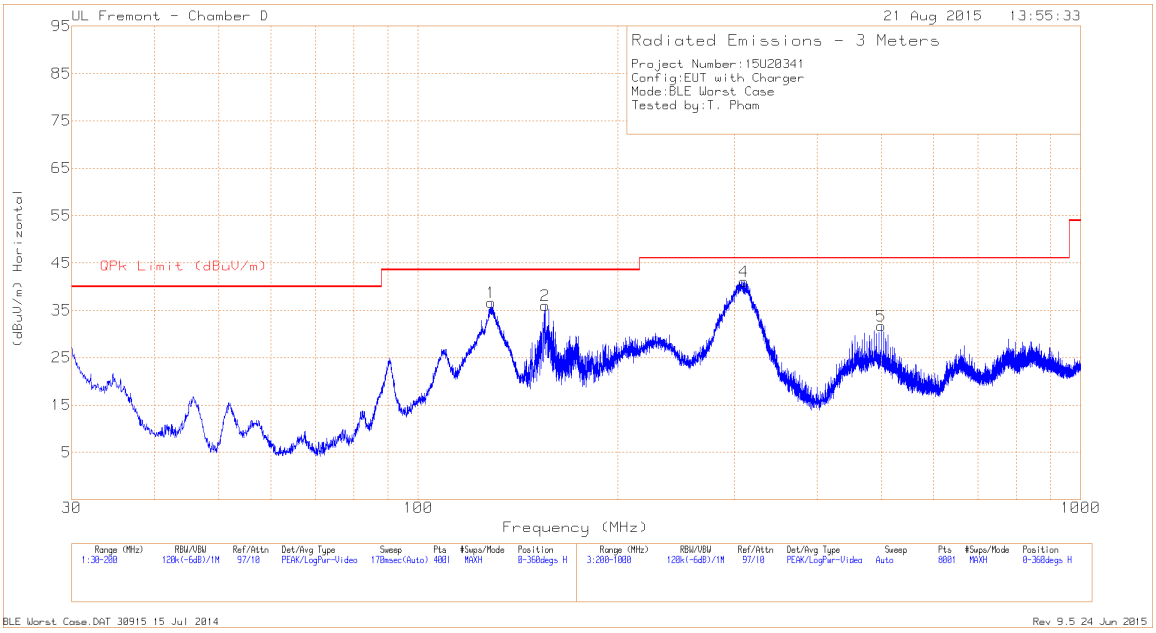
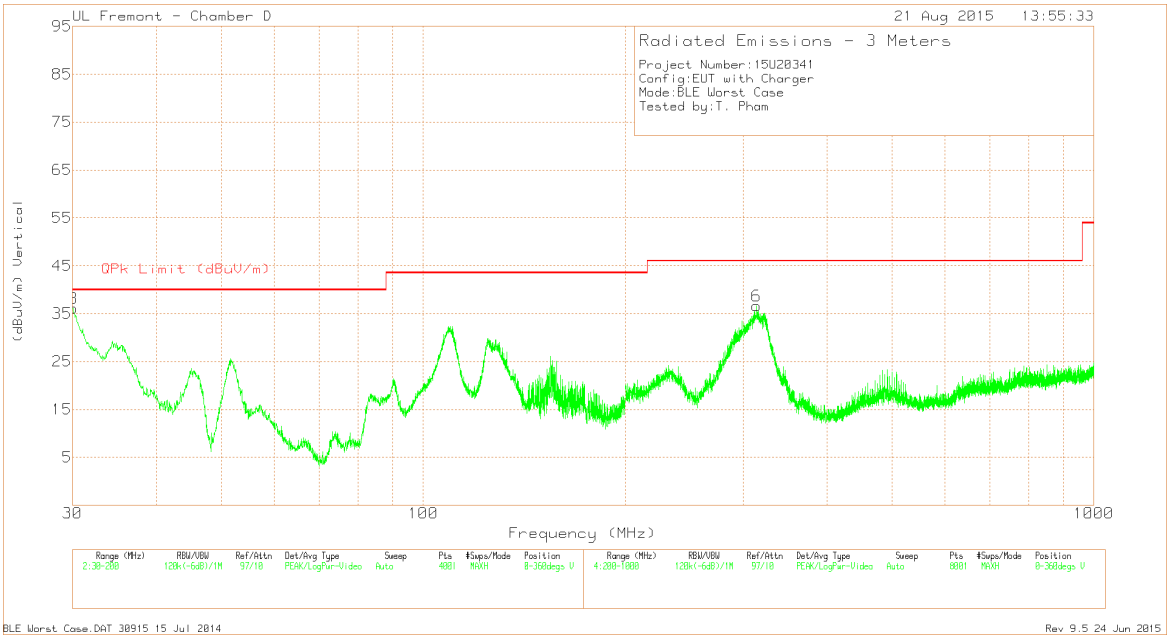
8.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL: PLOT



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DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T407 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 129.025	50.69	Qp	13.7	-31.2	33.19	43.52	-10.33	27	135	H
3	30.0425	44.05	Qp	21.5	-31.9	33.65	40	-6.35	185	100	V
2	155.375	44.07	Qp	12.1	-31.1	25.07	43.52	-18.45	321	122	H
4	310.5	55.81	Qp	13.3	-30.4	38.71	46.02	-7.31	145	189	H
6	314.1	53.36	Pk	13.6	-30.3	36.66	46.02	-9.36	0-360	100	V
5	500	43.94	Pk	17.4	-29.7	31.64	46.02	-14.38	0-360	100	H

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

Qp - Quasi-Peak detector

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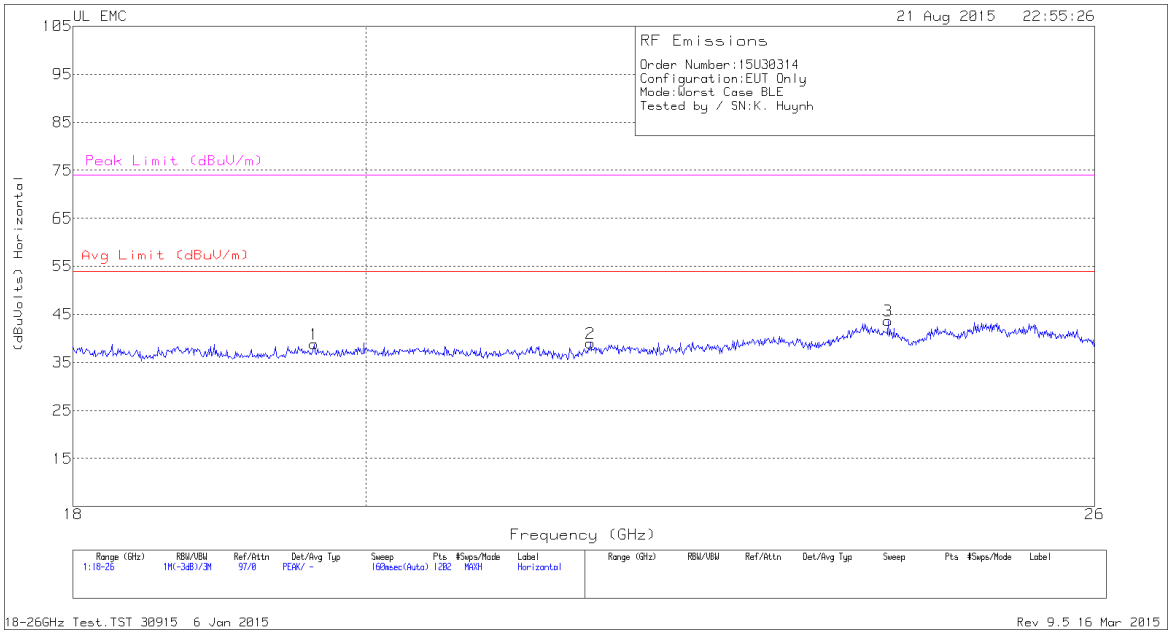
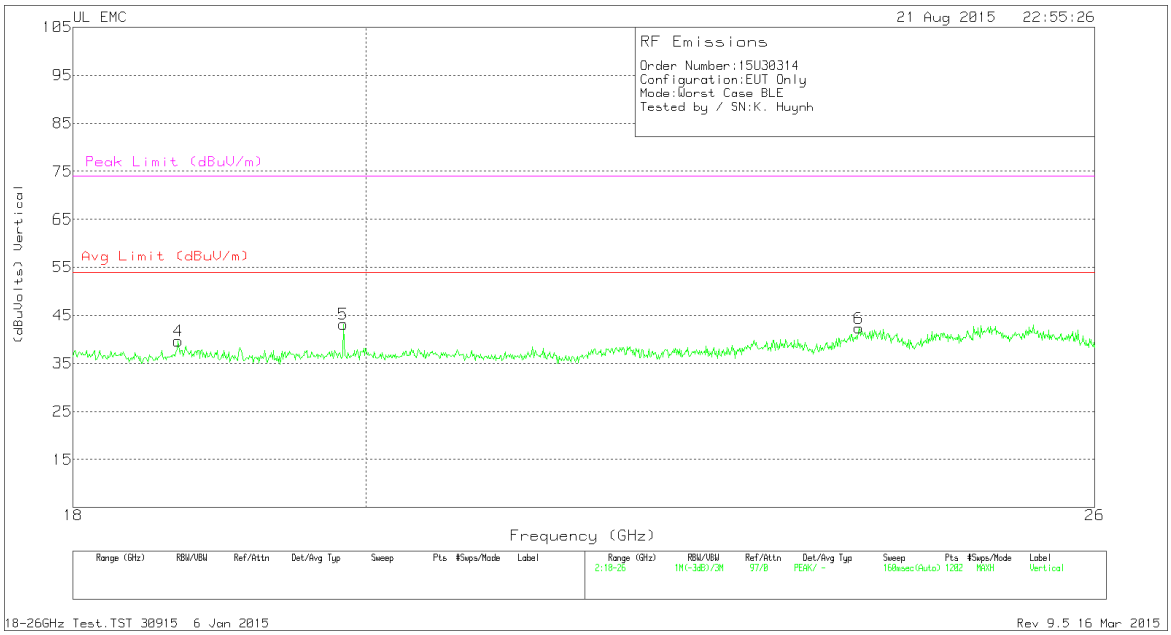
8.4. WORST-CASE 18 to 26 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



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DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	19.632	40.73	Pk	32.5	-24.9	-9.5	38.83	54	-15.17	74	-35.17
2	21.684	40.1	Pk	33.2	-24.8	-9.5	39	54	-15	74	-35
3	24.135	44.07	Pk	33.4	-24.3	-9.5	43.67	54	-10.33	74	-30.33
4	18.693	40.87	Pk	32.5	-24.2	-9.5	39.67	54	-14.33	74	-34.33
5	19.838	44.97	Pk	32.7	-25	-9.5	43.17	54	-10.83	74	-30.83
6	23.882	42.43	Pk	33.5	-24.1	-9.5	42.33	54	-11.67	74	-31.67

PK - Peak detector

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9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	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: 2013.

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 NEUTRAL and HOT lines.

RESULTS

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9.1. EUT POWERED BY AC/DC ADAPTER VIA USB CABLE

6 WORST EMISSIONS

Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
1	.2715	44.52	Pk	.6	0	45.12	61.07	-15.95		
2	.2805	37.16	Av	.6	0	37.76	-	-	50.8	-13.04
3	.4065	39.46	Pk	.4	0	39.86	57.72	-17.86		
4	.42	31.1	Av	.4	0	31.5	-	-	47.45	-15.95
5	.87	40.2	Pk	.3	0	40.5	56	-15.5		
6	.8475	29.5	Av	.3	0	29.8	-	-	46	-16.2
7	1.3065	38.73	Pk	.2	.1	39.03	56	-16.97		
8	1.284	24.02	Av	.2	.1	24.32	-	-	46	-21.68
9	24.5805	36.88	Pk	.3	.3	37.48	60	-22.52		
10	24.5715	25.77	Av	.3	.3	26.37	-	-	50	-23.63

Pk - Peak detector

Av - Average detection

Range 2: Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
11	.276	44.52	Pk	.7	0	45.22	60.94	-15.72		
12	.2805	36.89	Av	.6	0	37.49	-	-	50.8	-13.31
13	.42	40.27	Pk	.4	0	40.67	57.45	-16.78		
14	.42	32.19	Av	.4	0	32.59	-	-	47.45	-14.86
15	.9555	40.46	Pk	.3	0	40.76	56	-15.24		
16	.978	28.18	Av	.3	.1	28.58	-	-	46	-17.42
17	1.5	37.88	Pk	.2	.1	38.18	56	-17.82		
18	1.5225	24.88	Av	.2	.1	25.18	-	-	46	-20.82
19	3.5385	37.72	Pk	.2	.1	38.02	56	-17.98		
20	3.543	25	Av	.2	.1	25.3	-	-	46	-20.7

Pk - Peak detector

Av - Average detection

CISPR 11-22 CE Class B 150kHz-30MHz Stepping.TST 1 14 May 2015

Rev 9.5 26 May 2015

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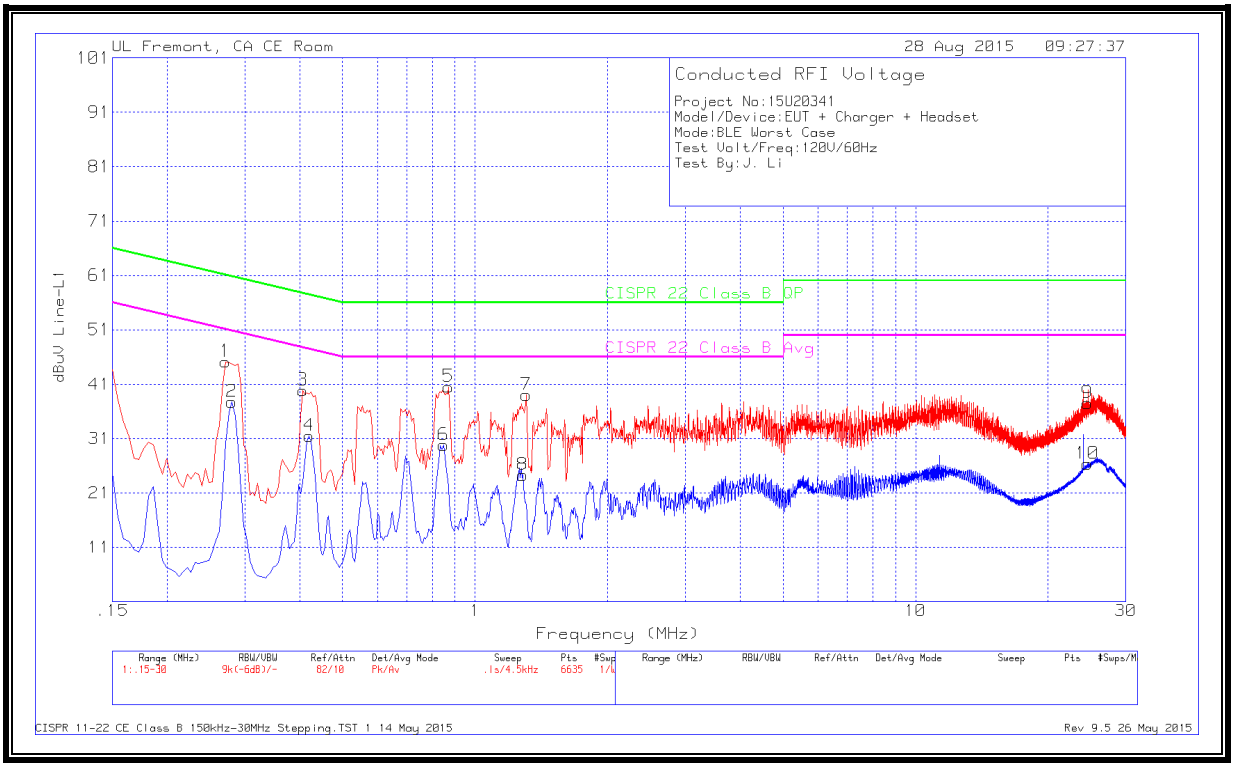
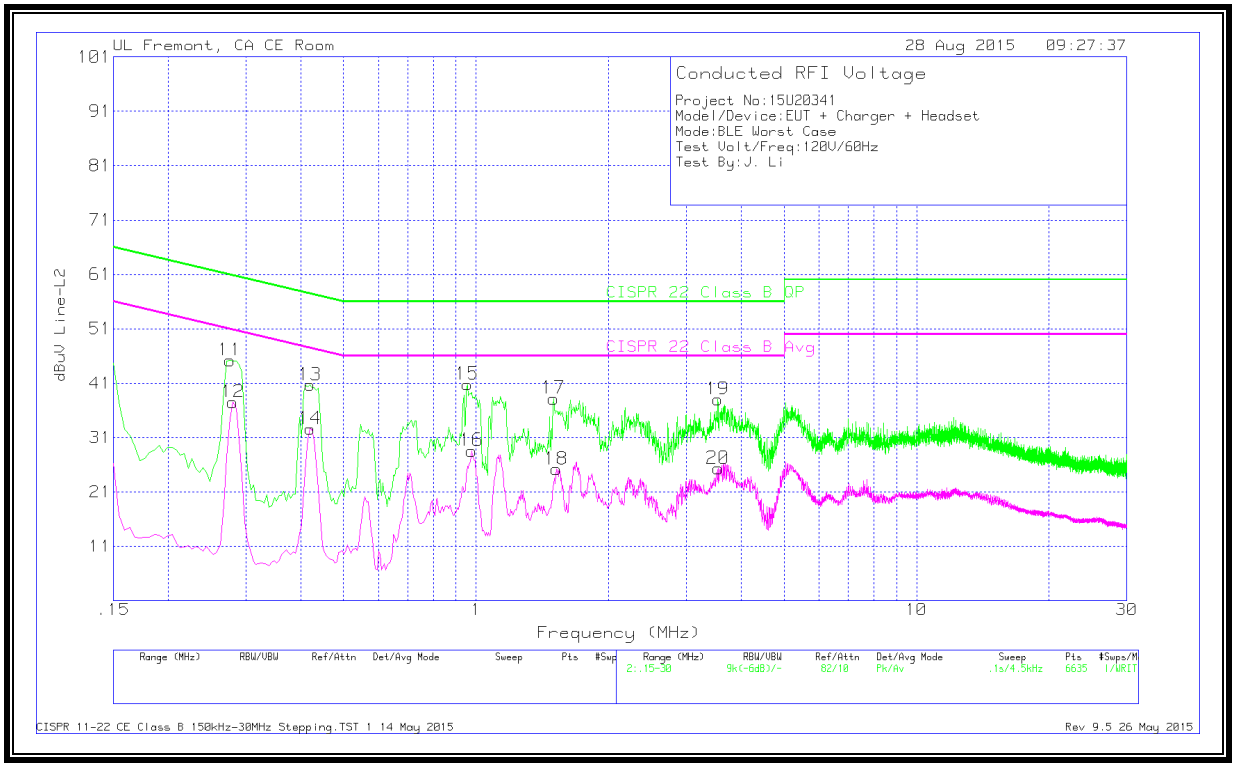
LINE 1 RESULTS



LINE 2 RESULTS



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9.2. EUT POWERED BY HOST PC VIA USB CABLE

6 WORST EMISSIONS

Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
1	.195	57.71	Pk	1	0	58.71	63.82	-5.11		
2	.1995	43.54	Av	.9	0	44.44	-	-	53.63	-9.19
3	.2625	49.47	Pk	.7	0	50.17	61.35	-11.18		
4	.267	35.54	Av	.6	0	36.14	-	-	51.21	-15.07
5	.6585	40.24	Pk	.3	0	40.54	56	-15.46		
6	.663	24.81	Av	.3	0	25.11	-	-	46	-20.89
7	12.9705	45.87	Pk	.2	.2	46.27	60	-13.73		
8	12.8985	34.37	Av	.2	.2	34.77	-	-	50	-15.23

Pk - Peak detector

Av - Average detection

Range 2: Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
9	.168	55.68	Pk	1.3	0	56.98	65.06	-8.08		
10	.195	37.33	Av	1	0	38.33	-	-	53.82	-15.49
11	.258	46.7	Pk	.7	0	47.4	61.5	-14.1		
12	.2625	33.08	Av	.7	0	33.78	-	-	51.35	-17.57
13	.906	41.05	Pk	.3	0	41.35	56	-14.65		
14	.9105	30.58	Av	.3	0	30.88	-	-	46	-15.12
15	13.371	44.01	Pk	.2	.2	44.41	60	-15.59		
16	13.371	33.81	Av	.2	.2	34.21	-	-	50	-15.79

Pk - Peak detector

Av - Average detection

CISPR 11-22 CE Class B 150kHz-30MHz Stepping.TST 1 14 May 2015

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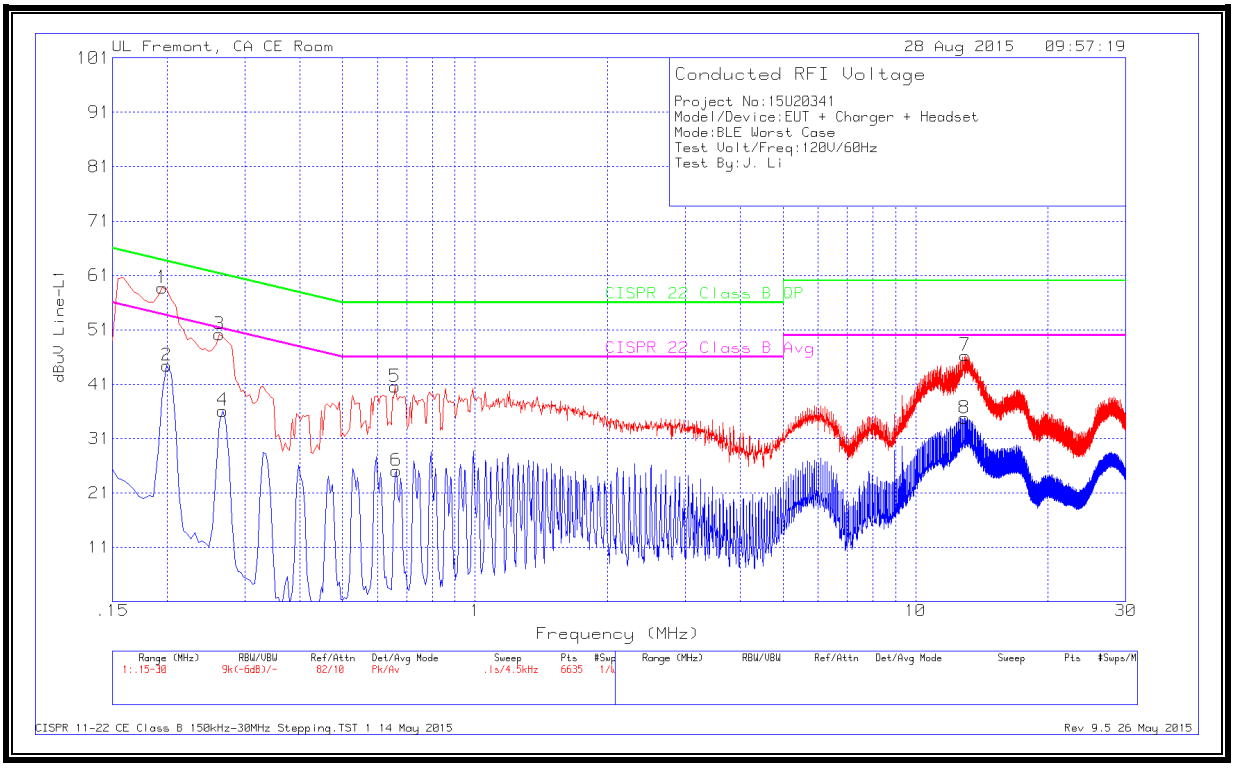
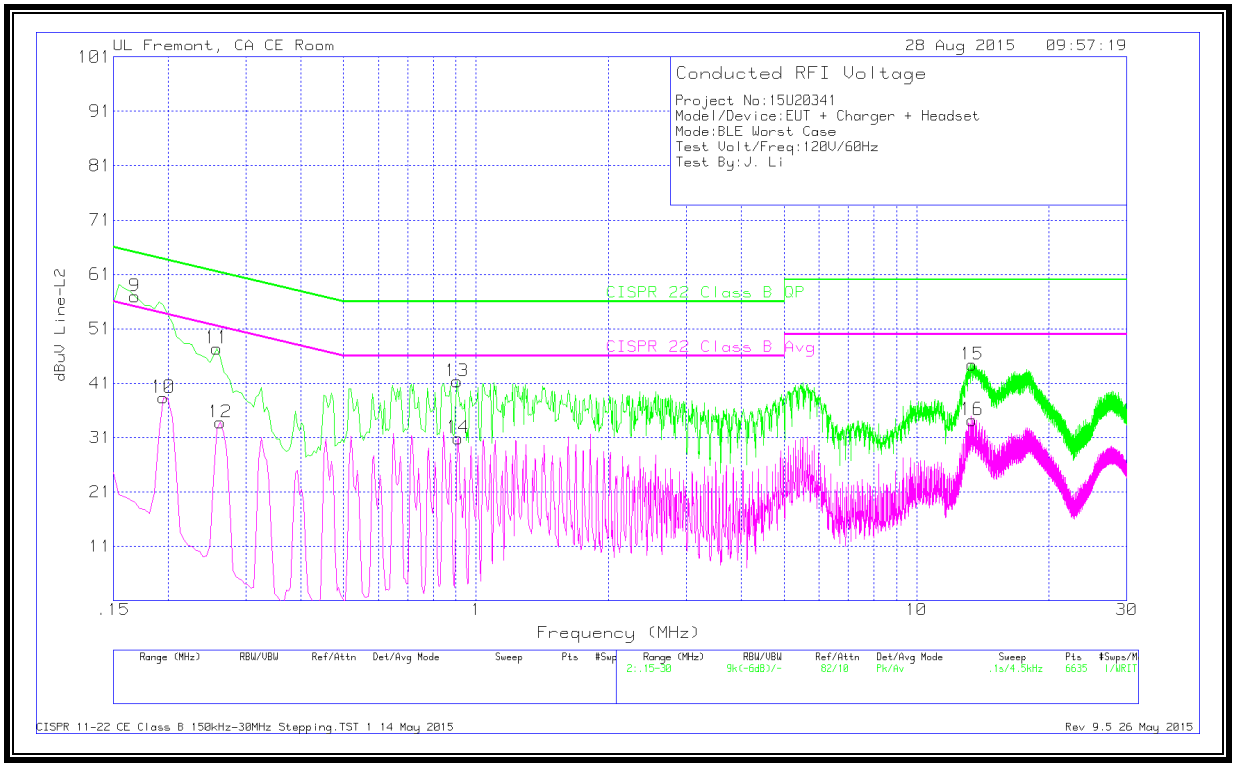
LINE 1 RESULTS



LINE 2 RESULTS



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