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

BLUETOOTH LOW ENERGY CERTIFICATION TEST REPORT

FOR

WIRELESS HEADPHONE

MODEL NUMBER: A1796

FCC ID: BCG-A1796
IC: 579C-A1796

REPORT NUMBER: 16U23789-E4V3

ISSUE DATE: AUGUST 29, 2016

Prepared for
APPLE, INC.
1 INFINITE LOOP
CUPERTINO, CA 95014, U.S.A.

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	08/24/2016	Initial Review	Mengistu Mekuria
V2	08/25/2016	Address TCB's Questions	Chin Pang
V3	08/29/2016	Updated Section 5.5	Chin Pang

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: WIRELESS HEADPHONE

MODEL: A1796

SERIAL NUMBER: FL6RX02FH8BD (Conducted) FL6RX02QH8VD (Radiated)

DATE TESTED: AUGUST 02, 2016 - AUGUST 17, 2016

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.

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UL VERIFICATION SERVICES INC.

Prepared By:

TONI 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, KDB 558074 D01 v03r05, 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, 9KHz to 0.15 MHz	± 3.84dB
Conducted Disturbance, 0.15 to 30 MHz	± 3.65 dB
Radiated Disturbance, 9KHz to 30 MHz	± 3.15 dB
Radiated Disturbance, 30 to 1000 MHz	± 5.36 dB
Radiated Disturbance,1000 to 18000 MHz	± 4.32 dB
Radiated Disturbance,18000 to 26000 MHz	± 4.45 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 wireless headphone. It has an integral battery, microphone and antenna. It can play music from a Bluetooth audio source, or through the 3.5mm stereo audio jack. It has a USB Micro port for charging. It has 4 buttons, power, volume up, volume down, and multi-function.

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	5.98	3.96

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Gain
2.4	3.14

5.4. SOFTWARE AND FIRMWARE

The software installed in the EUT during testing was 1A341

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5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case mode and channel used for 30-1000 MHz radiated emissions and AC line conducted emission were including AC/DC charger, mode and channel with the highest output power. EUT is transmitting while in charging mode

Above 1G radiated emission were performed with low, middle and high channels. And above 18GHz radiated emission were performed with the EUT only 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 (Flatbed), Y (Landscape) and Z (Portrait), it was determined that Z orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in Z orientation.

Data rate tested:

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	Apple	A1424	NSW25679	N/A
Test Jig	Apple	N/A	920-02191-02	N/A
Laptop	Apple	MacBook AIR	C02P41R2G086	N/A
USB	Apple	N/A	N/A	N/A
AC/DC Adapter	Apple	A1385	D292365A20FDHLHCW	N/A

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	AC	1	AC	Un-shielded	2	N/A

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

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

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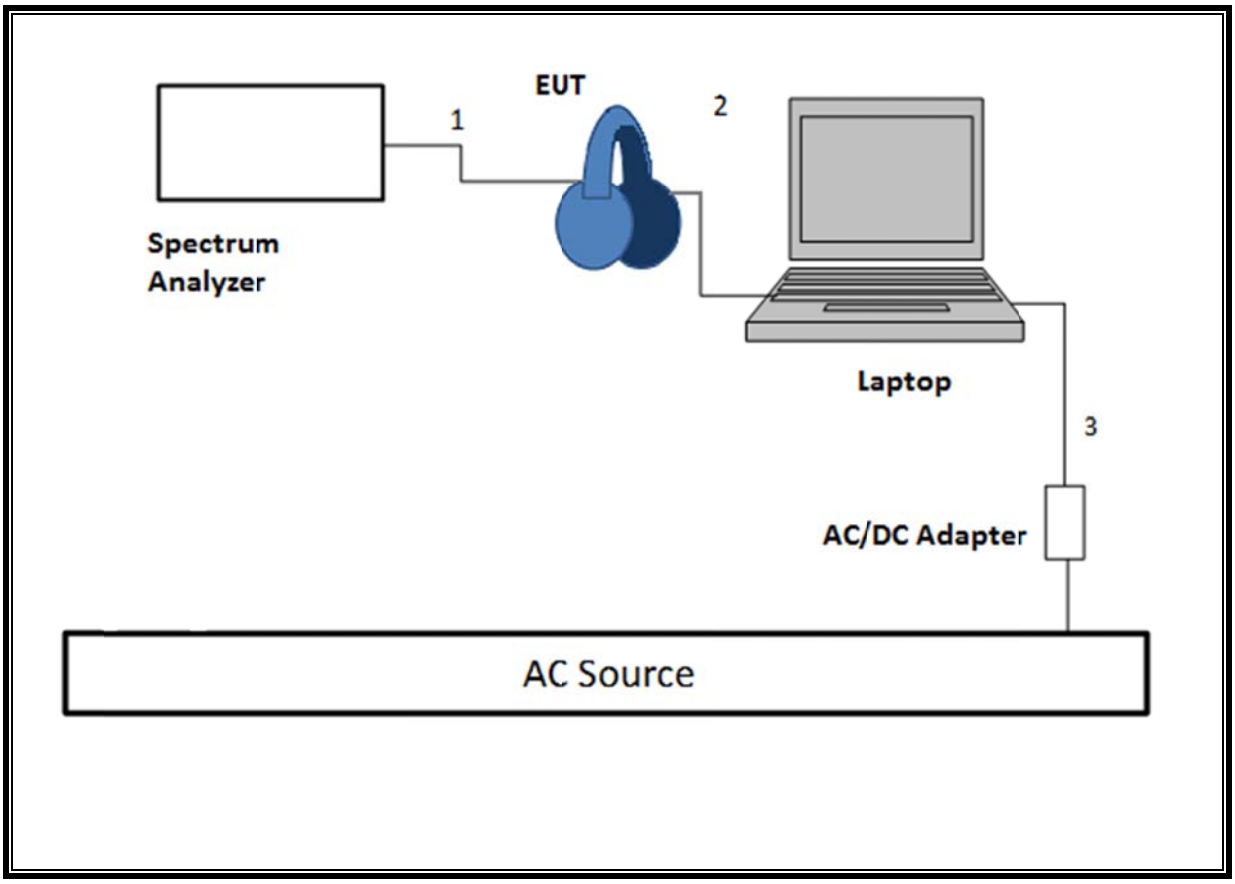
TEST SETUP- CONDUCTED PORT

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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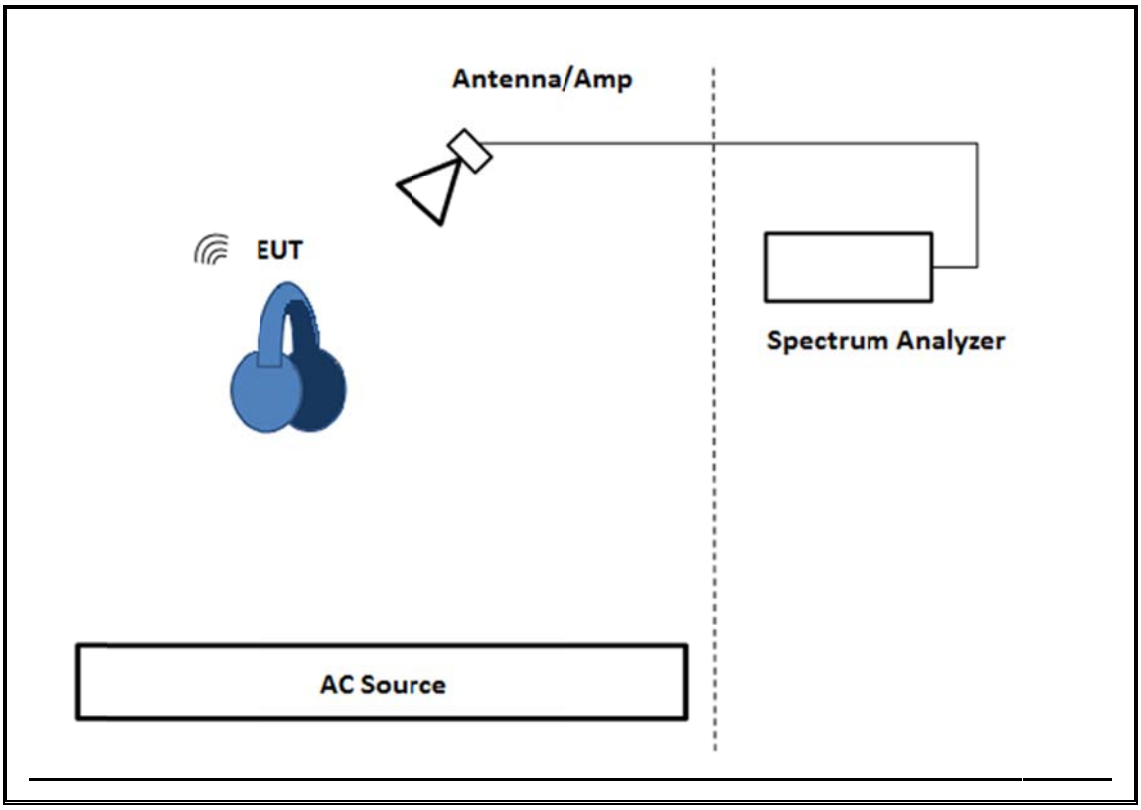
TEST SETUP- RADIATED-ABOVE 1 GHZ

The EUT was powered battery. Test software exercised the EUT.

SETUP DIAGRAM



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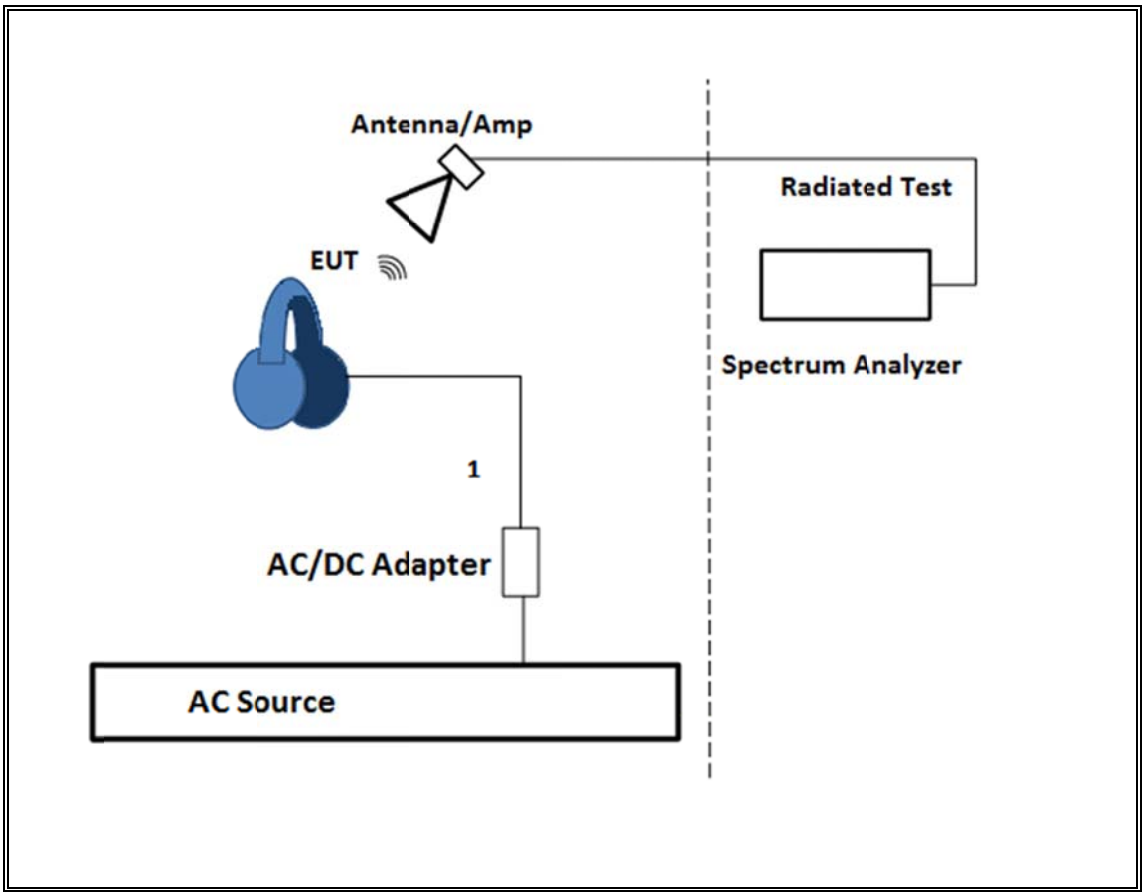
TEST SETUP- BELOW 1GHz

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

SETUP DIAGRAM



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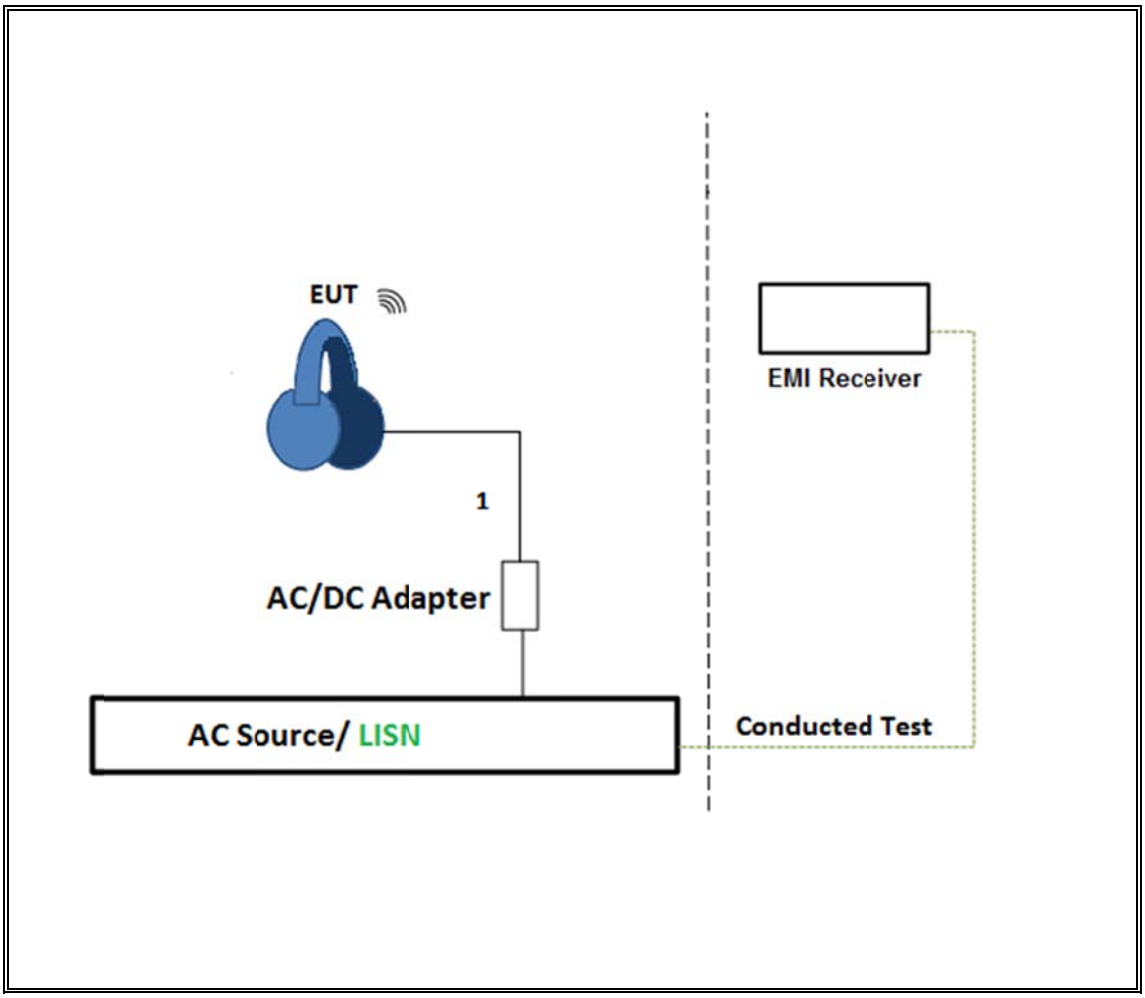
TEST SETUP- AC LINE CONDUCTED: AC/DC ADAPTER

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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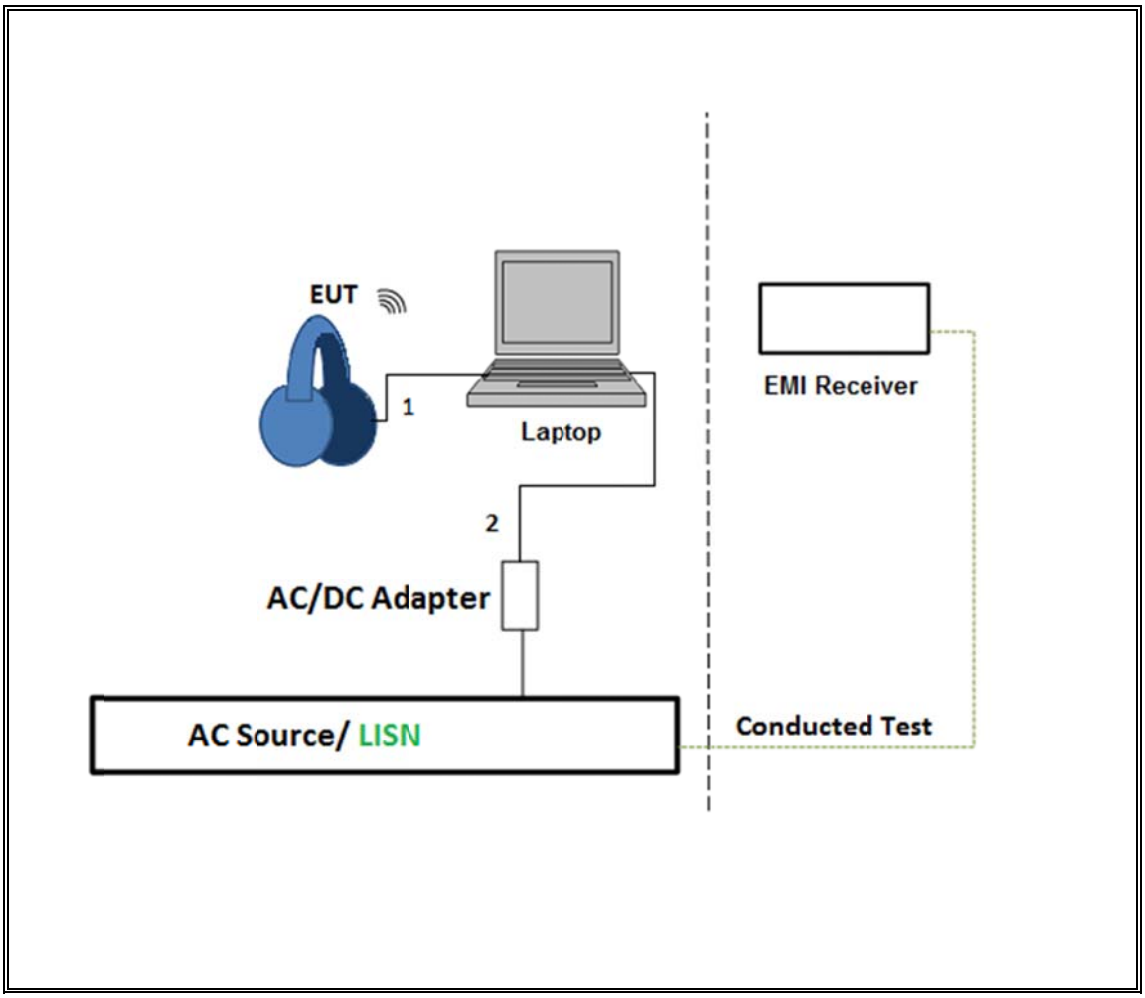
TEST SETUP- AC LINE CONDUCTED: LAPTOP CONFIGURATION

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**	**T Number**	**Cal Due**
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T120	4/5/2017
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T122	1/29/2017
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T173	6/17/2017
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	T341	10/14/2016
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T862	4/18/2017
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T899	5/26/2017
Amplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	T491	5/31/2017
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T834	6/17/2017
Power Meter, P-series single channel	Agilent	N1911A	T1271	7/8/2017
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Agilent	N1921A	T1228	6/20/2017
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826	T447	6/16/2017
Spectrum Analyzer, 40 GHz	Agilent	8564E	T106	8/13/2016
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Keysight	8449B	T402	7/5/2017
AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	100935	9/16/2016
LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2	161124	9/16/2016
Power Cable, Line Conducted Emissions	U L	PG1	N/A	7/28/2016
UL SOFTWARE				
* Radiated Software	UL	UL EMC	Ver 9.5, June 24, 2015	
* Conducted Software	UL	UL EMC	Ver 4.0, January 11, 2016	
* AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 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

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

Output Power: KDB 558074 D01 v03r05, Section 9.1.2.

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

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

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

Band-edge: KDB 558074 D01 v03r05, 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	1.000	1.000	1.000	100.00%	0.00	0.010

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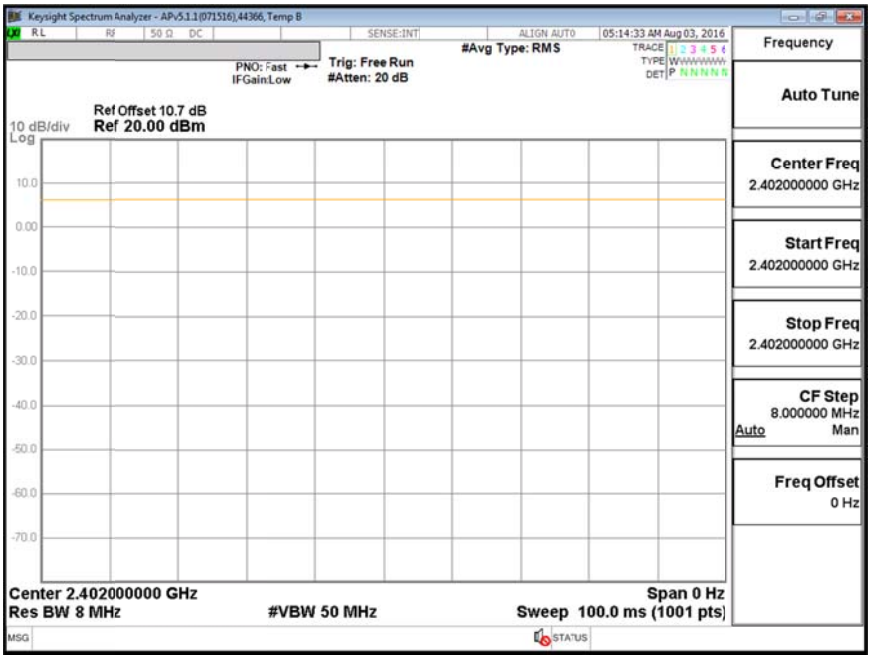
DUTY CYCLE PLOTS

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	0.748	0.5
Middle	2440	0.746	0.5
High	2480	0.710	0.5

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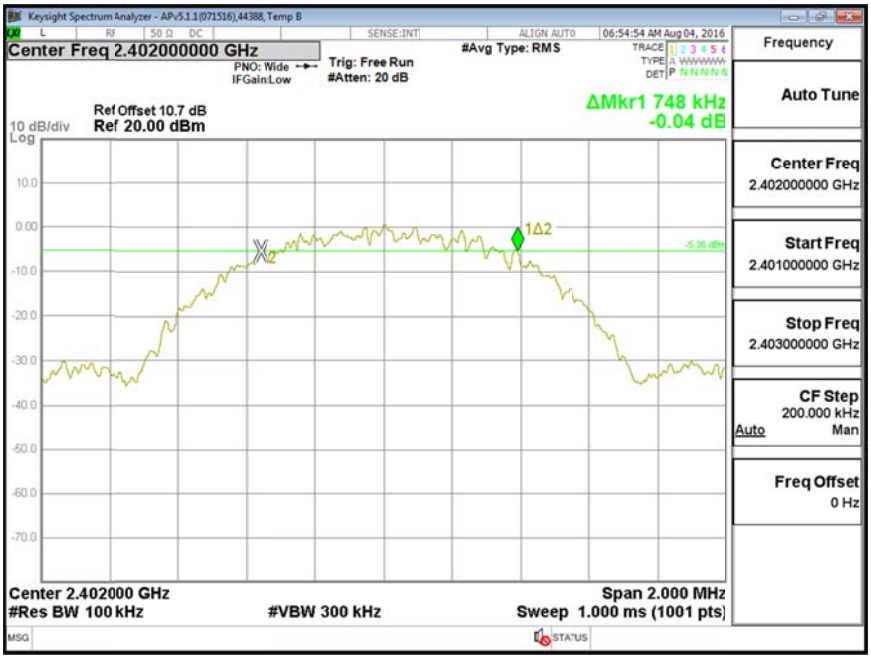
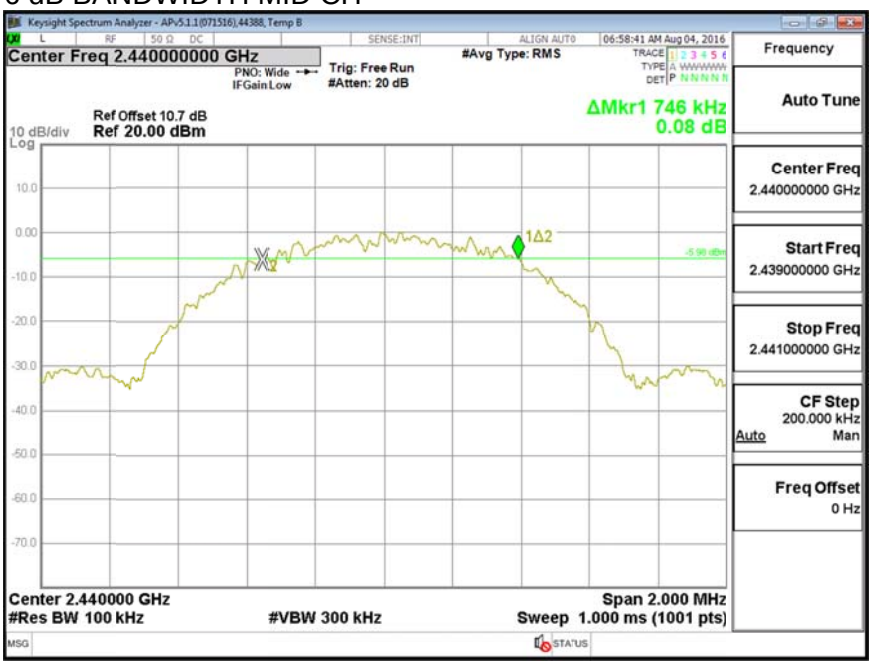
6 dB BANDWIDTH

6 dB BANDWIDTH LOW CH



6 dB BANDWIDTH MID CH



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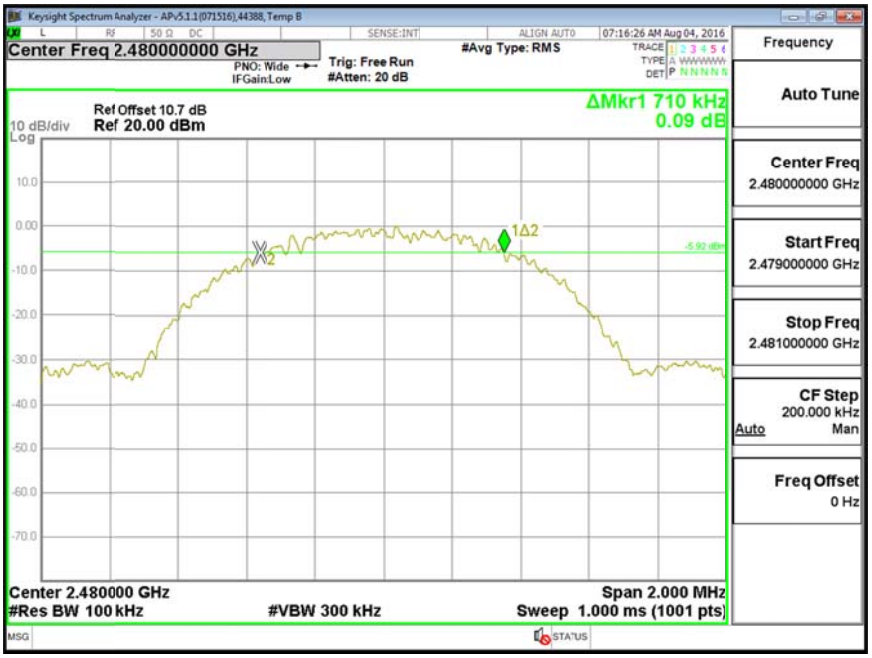
6 dB BANDWIDTH HIGH CH



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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	1.0396
Middle	2440	1.0410
High	2480	1.0360

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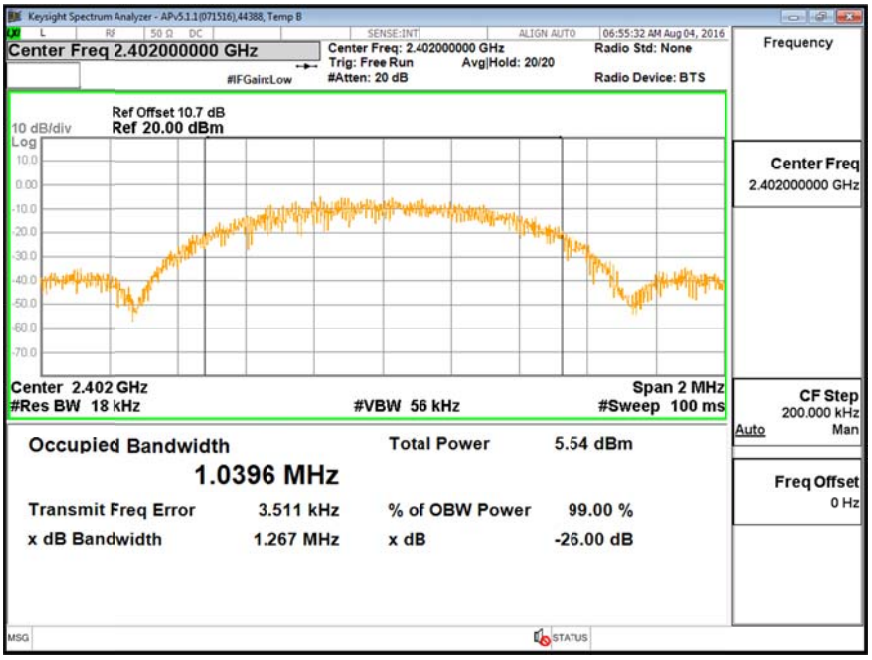
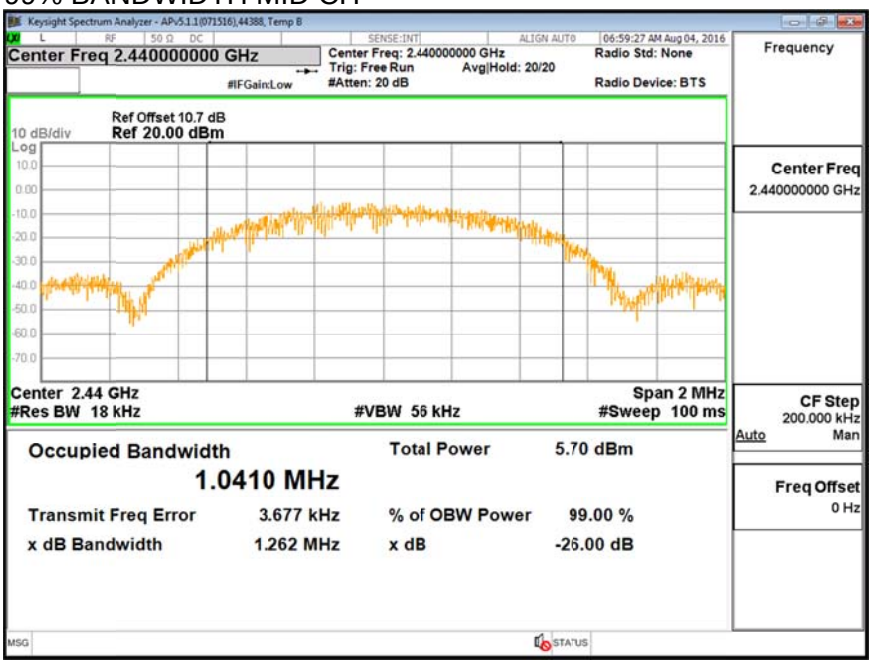
99% BANDWIDTH

99% BANDWIDTH LOW CH



99% BANDWIDTH MID CH



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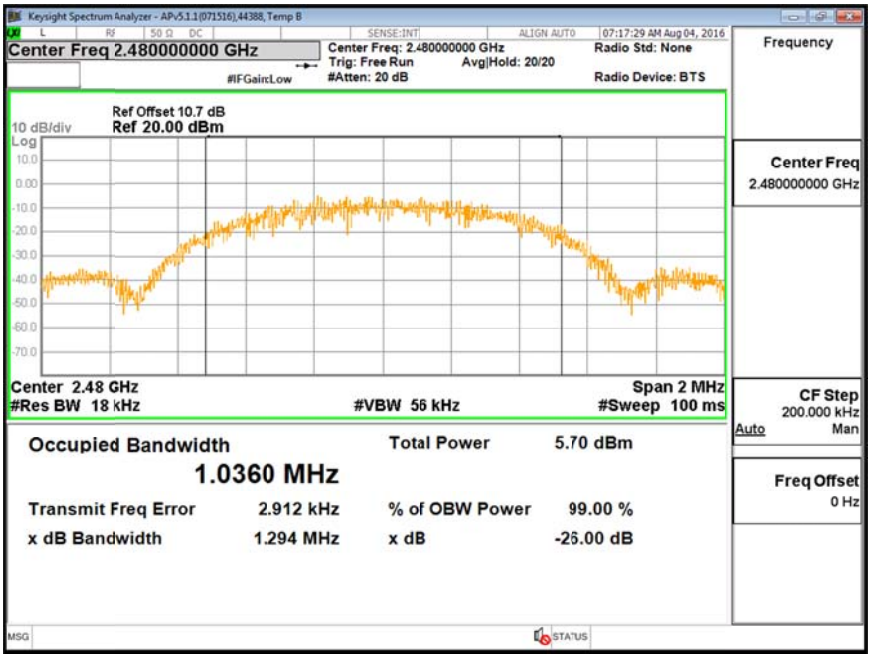
99% BANDWIDTH HIGH CH



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7.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

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.

ID:	39472	Date:	8/16/16

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	5.44
Middle	2440	5.37
High	2480	5.40

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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.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

ID:	39472	Date:	8/16/16

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.83	30	-24.175
Middle	2440	5.98	30	-24.023
High	2480	5.97	30	-24.027

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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	-10.18	8	-18.18
Middle	2440	-9.97	8	-17.97
High	2480	-10.14	8	-18.14

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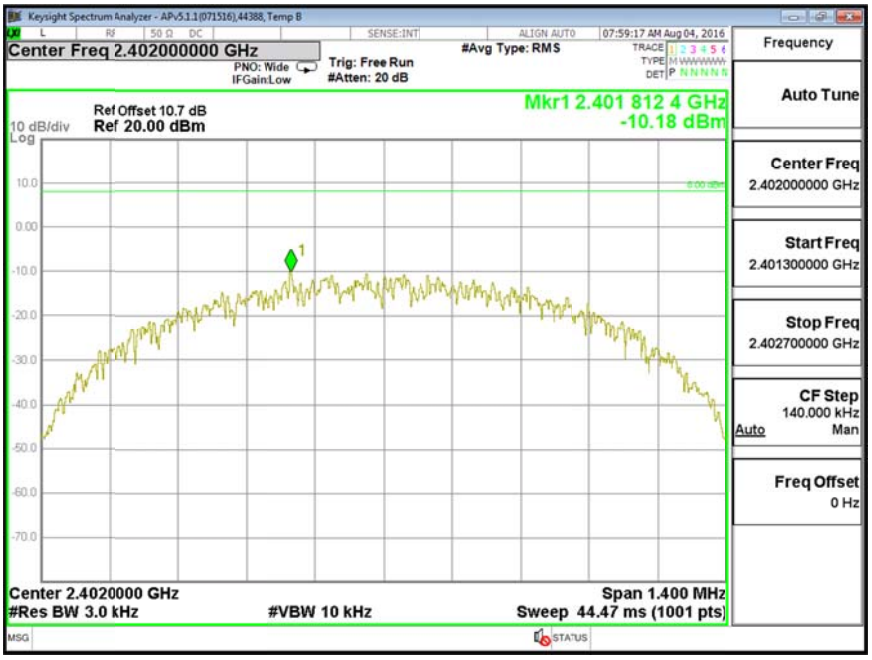
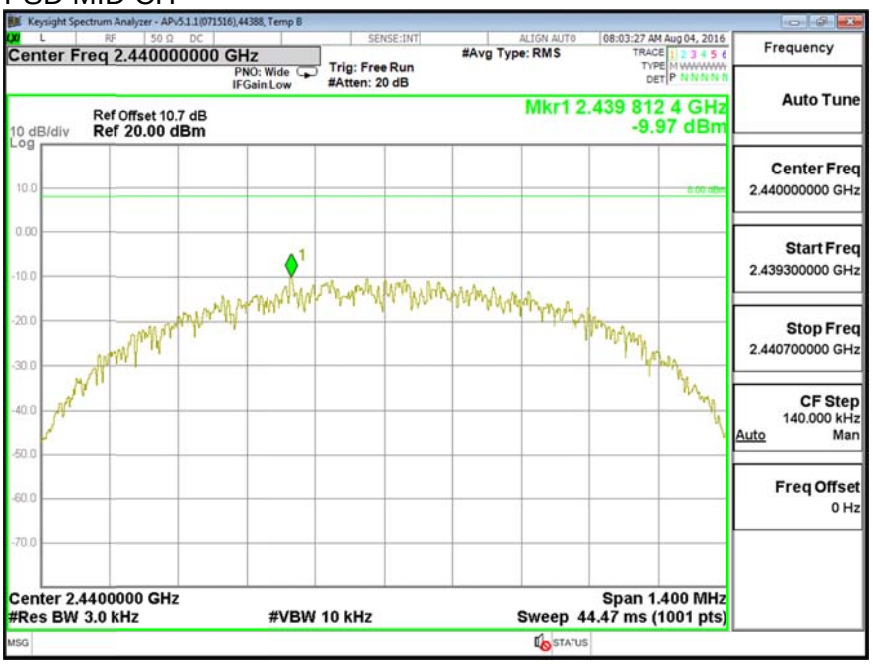
POWER SPECTRAL DENSITY

PSD LOW CH



PSD MID CH



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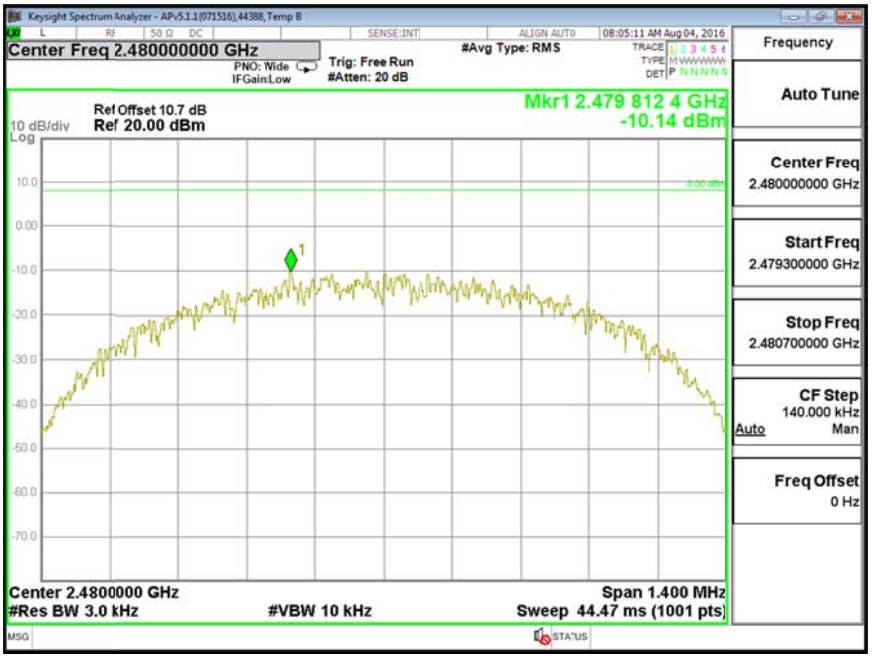
PSD HIGH CH



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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

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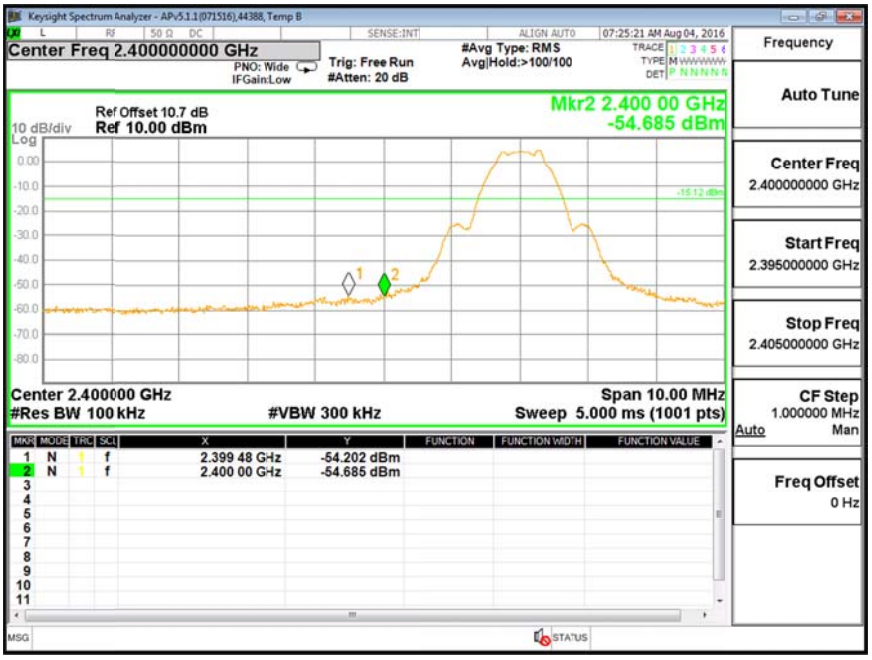
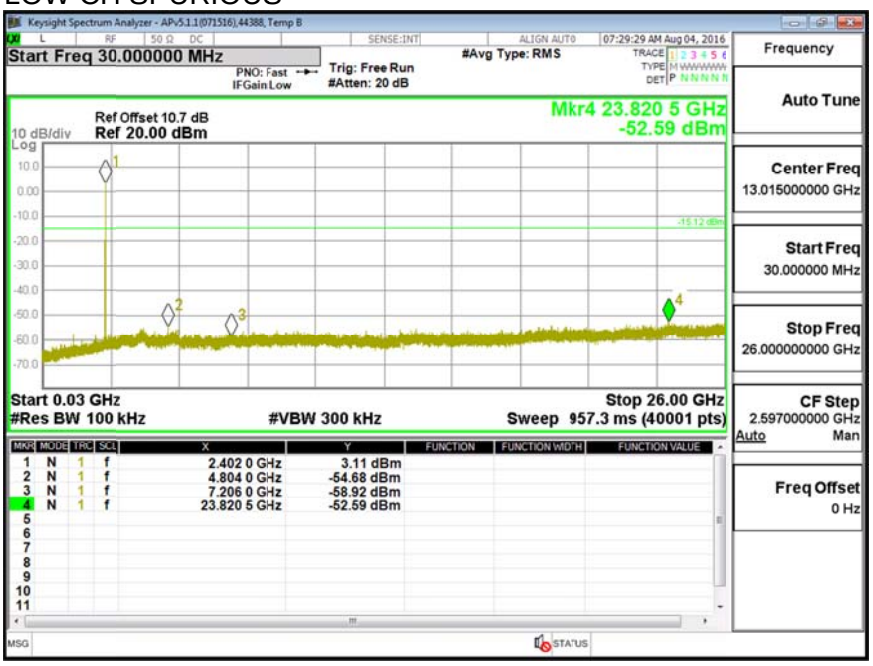
SPURIOUS EMISSIONS, LOW CHANNEL

LOW CH BANDEDGE



LOW CH SPURIOUS



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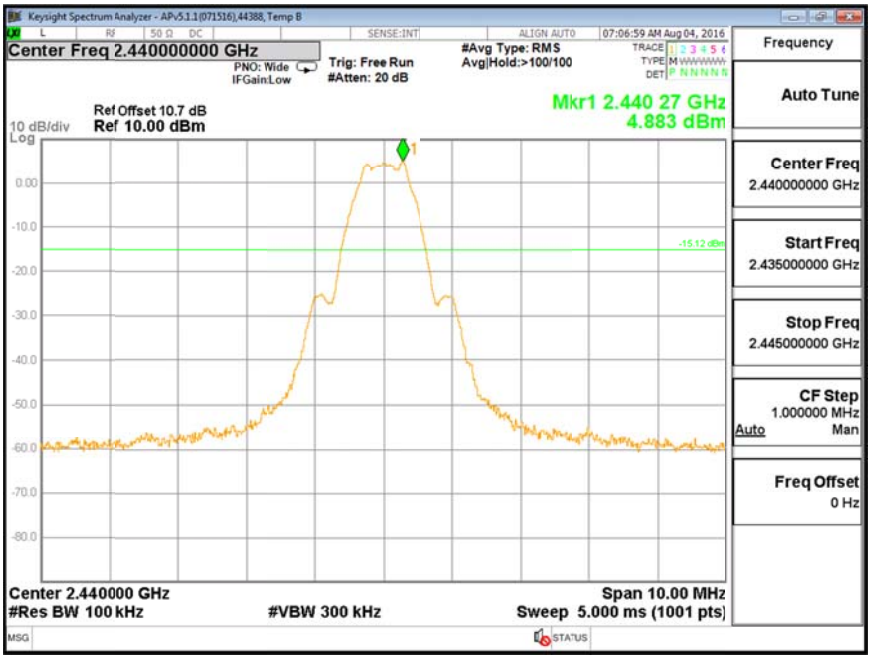
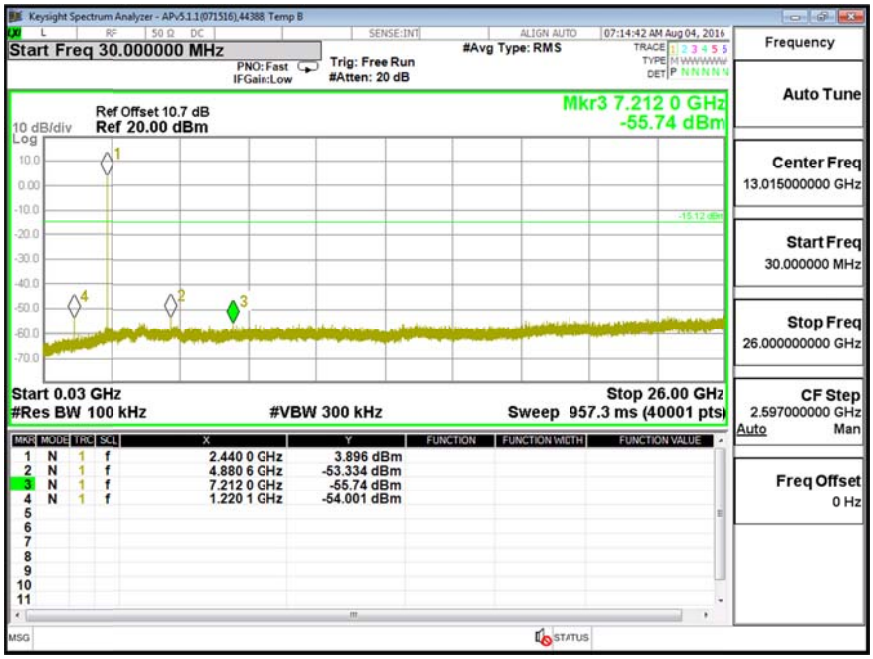
SPURIOUS EMISSIONS, MID CHANNEL

MID CH REFERENCE



MID CH SPURIOUS



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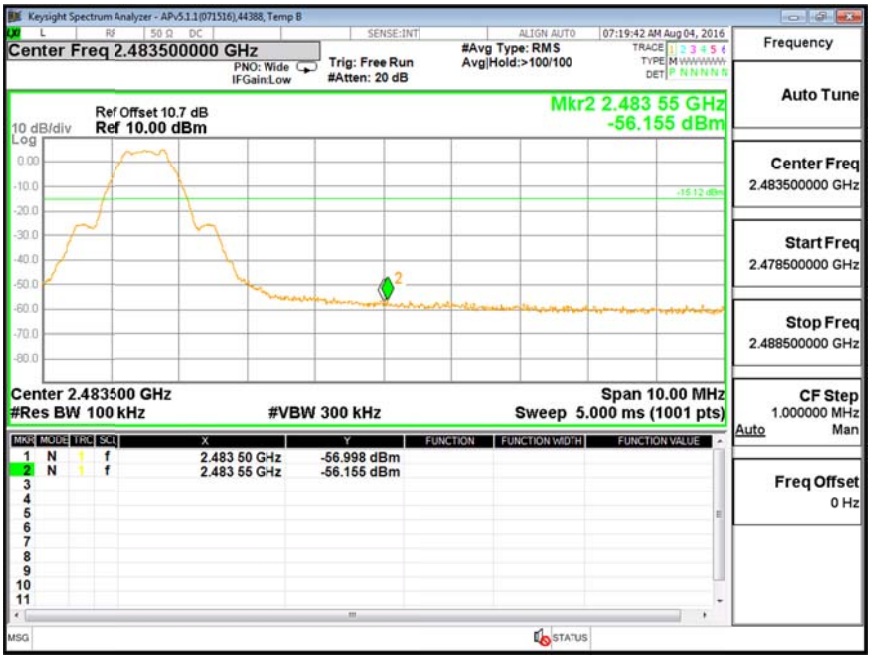
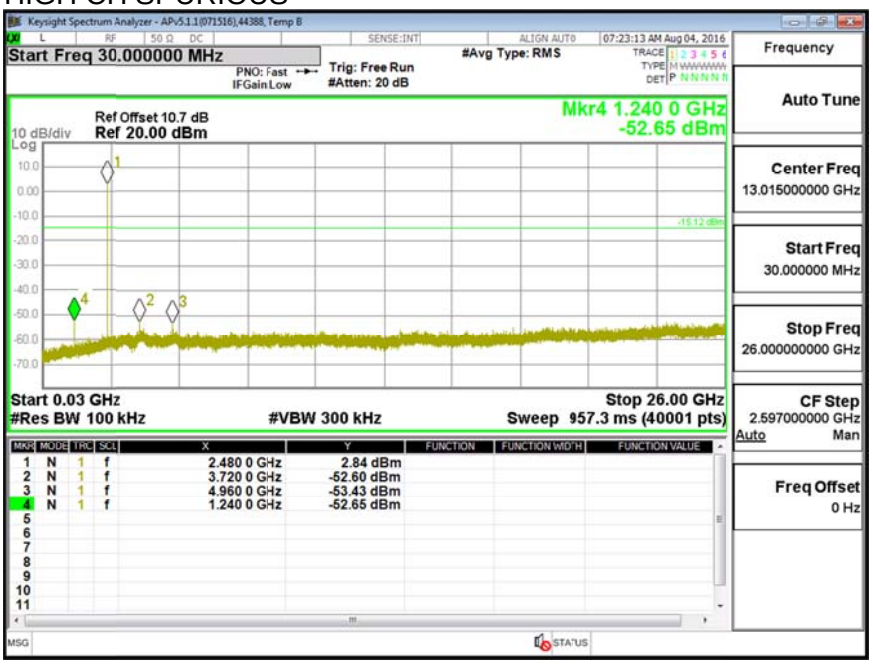
SPURIOUS EMISSIONS, HIGH CHANNEL

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 (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

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 pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

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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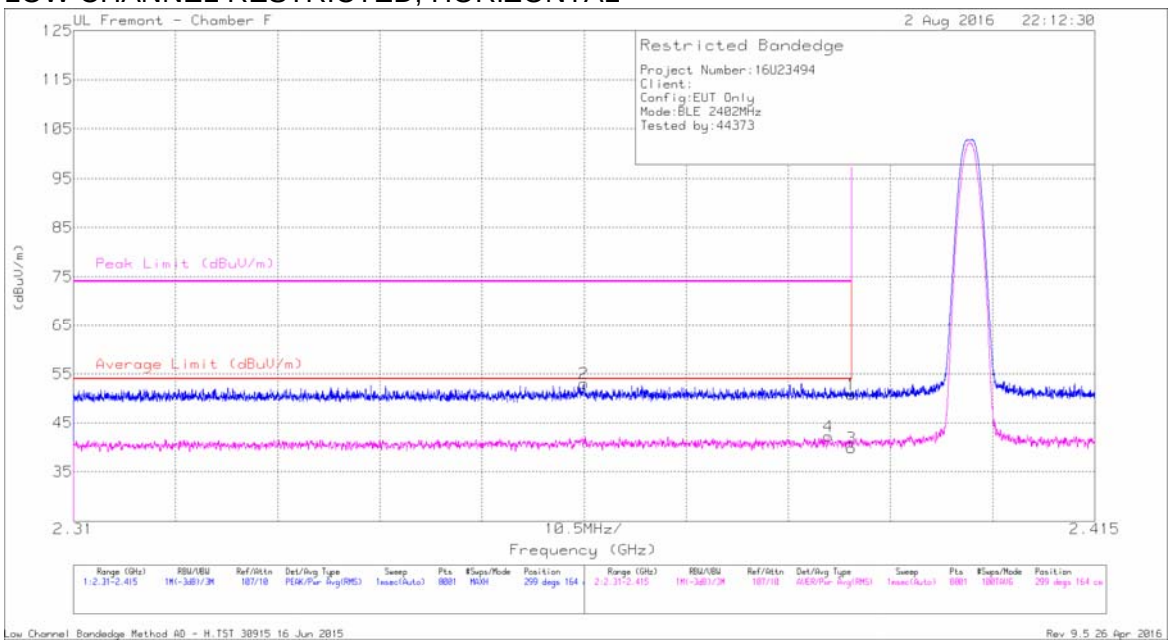
8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. RESTRICTED BANDEDGE

LOW CHANNEL RESTRICTED, HORIZONTAL



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl /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	39.57	Pk	32.1	-20.9	50.77	-	-	74	-23.23	299	164	H
2	* 2.362	41.96	Pk	32	-20.9	53.06	-	-	74	-20.94	299	164	H
3	* 2.39	28.71	RMS	32.1	-20.9	39.91	54	-14.09	-	-	299	164	H
4	* 2.388	31.03	RMS	32.1	-20.9	42.23	54	-11.77	-	-	299	164	H

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

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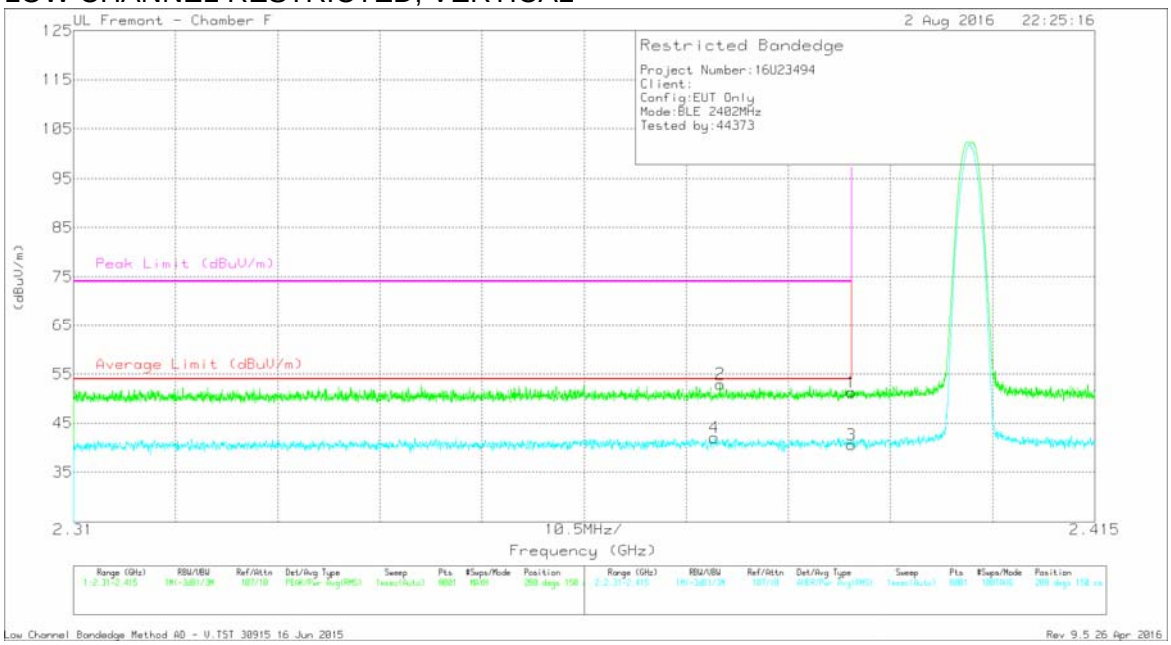
LOW CHANNEL RESTRICTED, VERTICAL



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/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	40.1	Pk	32.1	-20.9	51.3	-	-	74	-22.7	288	150	V
2	* 2.376	41.76	Pk	32.1	-20.9	52.96	-	-	74	-21.04	288	150	V
3	* 2.39	29.39	RMS	32.1	-20.9	40.59	54	-13.41	-	-	288	150	V
4	* 2.376	30.84	RMS	32.1	-20.9	42.04	54	-11.96	-	-	288	150	V

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

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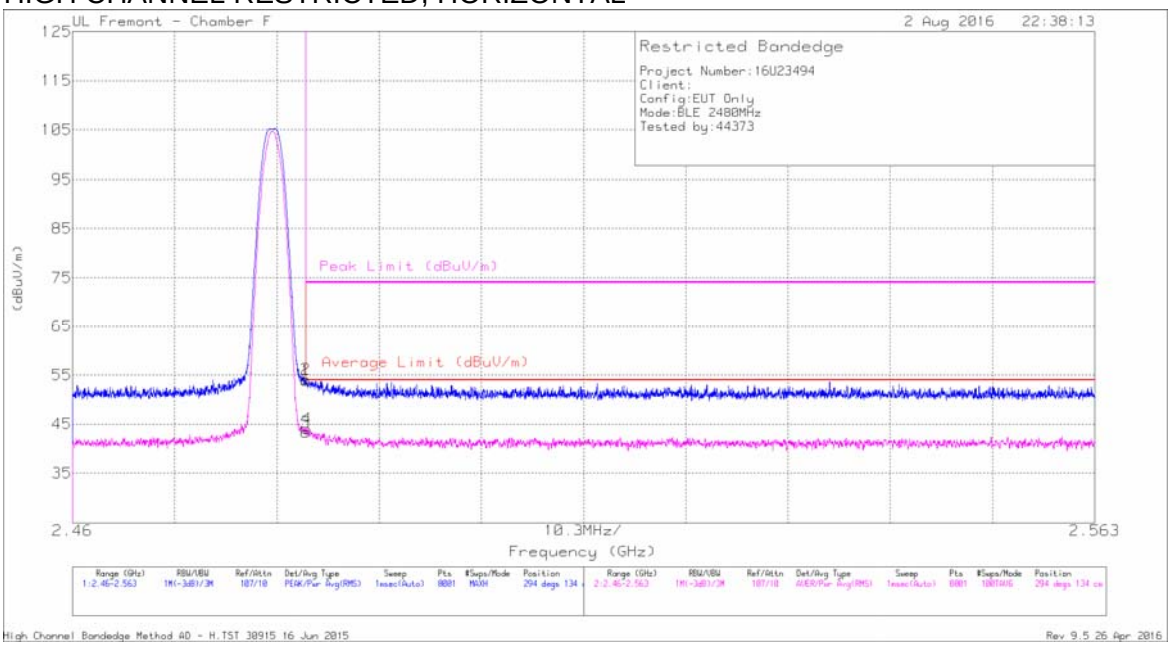
HIGH CHANNEL RESTRICTED, HORIZONTAL



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	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	42.63	Pk	32.3	-21	53.93	-	-	74	-20.07	294	134	H
2	* 2.484	42.87	Pk	32.3	-21	54.17	-	-	74	-19.83	294	134	H
3	* 2.484	32	RMS	32.3	-21	43.3	54	-10.7	-	-	294	134	H
4	* 2.484	32.76	RMS	32.3	-21	44.06	54	-9.94	-	-	294	134	H

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

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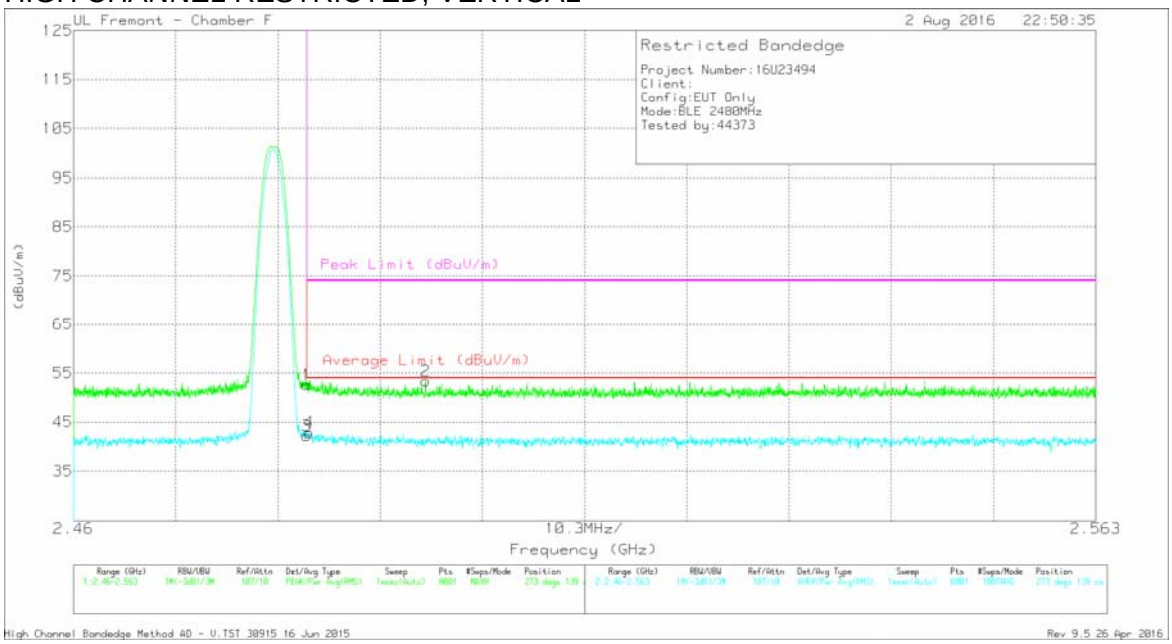
HIGH CHANNEL RESTRICTED, VERTICAL



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	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	41.31	Pk	32.3	-21	52.61	-	-	74	-21.39	273	139	V
2	* 2.495	42.13	Pk	32.3	-21	53.43	-	-	74	-20.57	273	139	V
3	* 2.484	30.88	RMS	32.3	-21	42.18	54	-11.82	-	-	273	139	V
4	* 2.484	31.6	RMS	32.3	-21	42.9	54	-11.1	-	-	273	139	V

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

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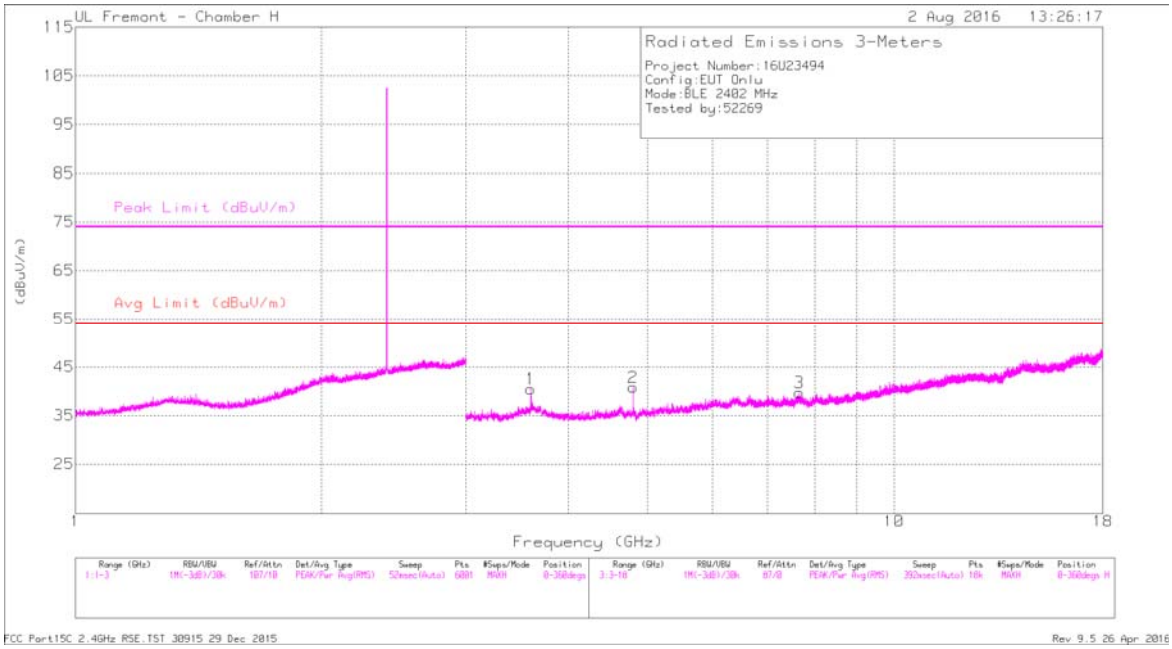
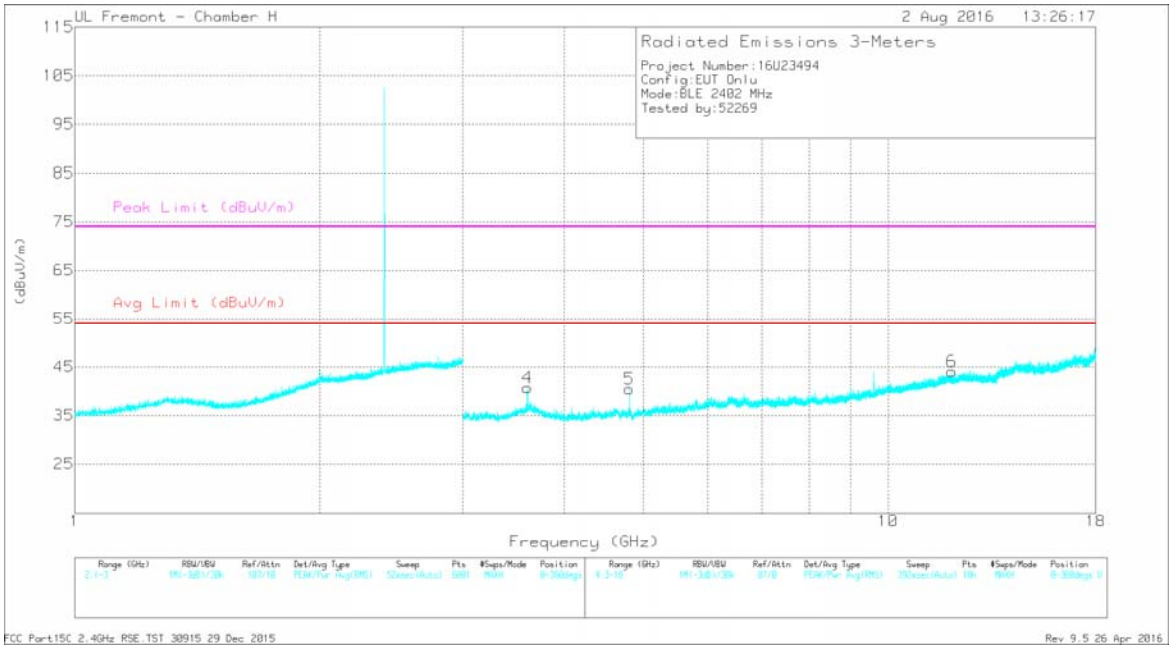
8.2.2. HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



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DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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	* 3.603	45.13	PK2	34.9	-35.6	44.43	-	-	74	-29.57	220	191	H
	* 3.603	37.14	MAv1	34.9	-35.6	36.44	54	-17.56	-	-	220	191	H
2	* 4.804	47.89	PK2	34	-35.1	46.79	-	-	74	-27.21	0	215	H
	* 4.804	39.96	MAv1	34	-35.1	38.86	54	-15.14	-	-	0	215	H
3	* 7.658	40.17	PK2	35.8	-30.2	45.77	-	-	74	-28.23	24	236	H
	* 7.655	29.68	MAv1	35.8	-30.2	35.28	54	-18.72	-	-	24	236	H
4	* 3.603	44.89	PK2	34.9	-35.6	44.19	-	-	74	-29.81	94	106	V
	* 3.603	36.89	MAv1	34.9	-35.6	36.19	54	-17.81	-	-	94	106	V
5	* 4.803	47.56	PK2	34	-35.1	46.46	-	-	74	-27.54	75	258	V
	* 4.804	38.93	MAv1	34	-35.1	37.83	54	-16.17	-	-	75	258	V
6	* 11.97	37.39	PK2	39.2	-26.9	49.69	-	-	74	-24.31	174	180	V
	* 11.97	26.58	MAv1	39.2	-26.9	38.88	54	-15.12	-	-	174	180	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

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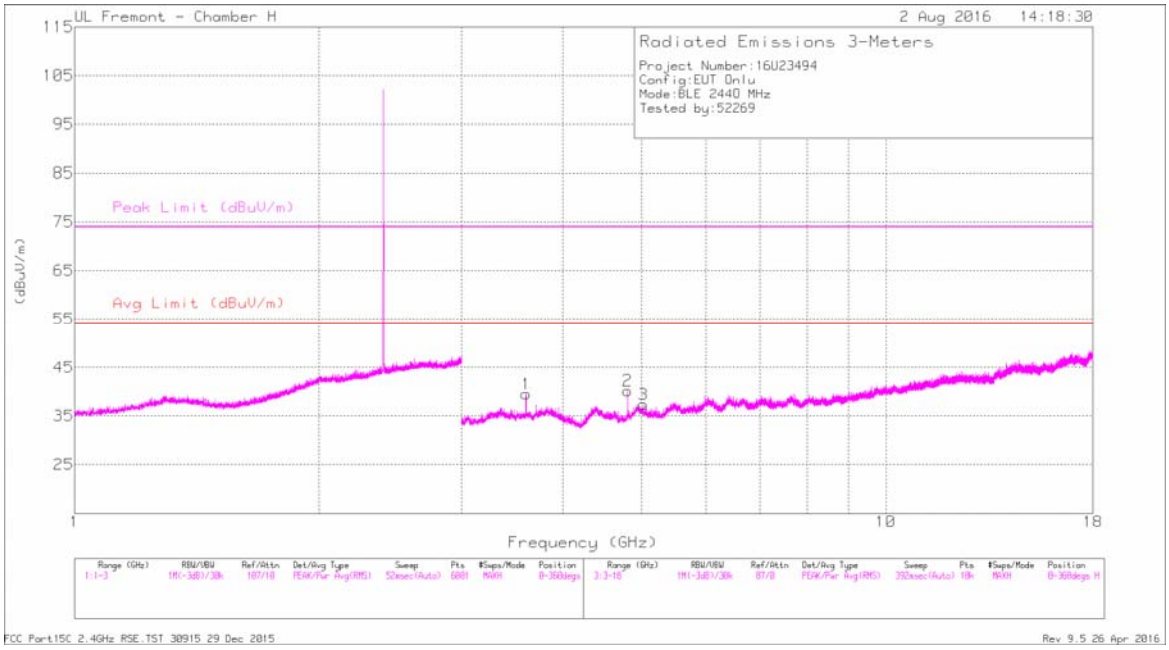
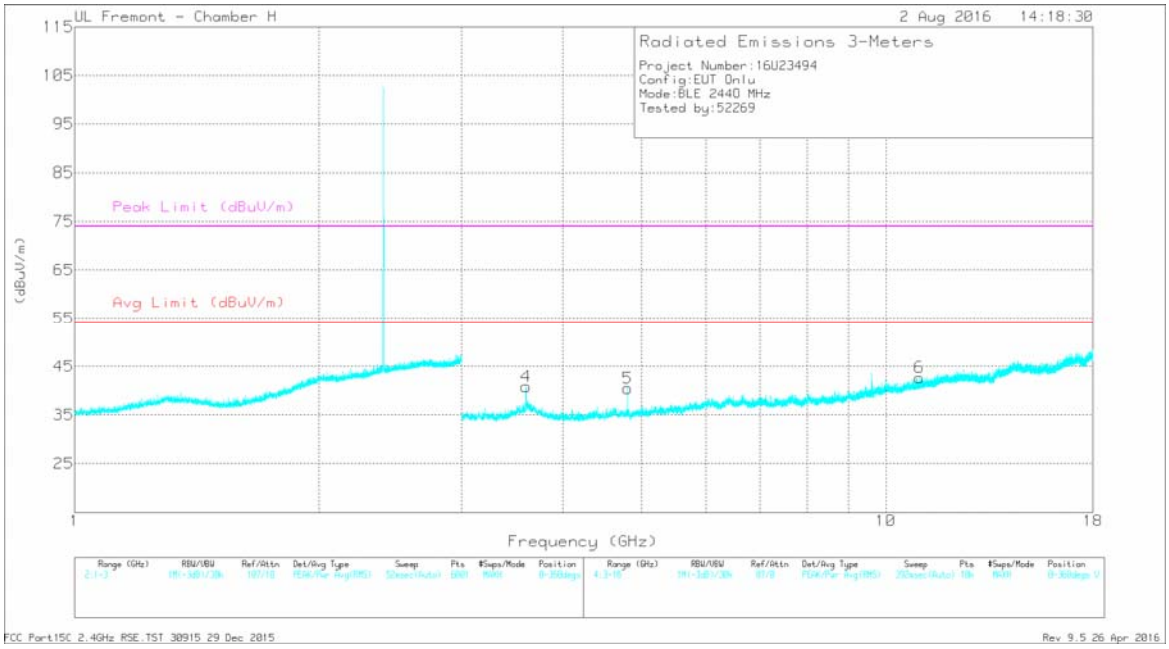
MID CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



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DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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	* 3.603	46.08	PK2	34.9	-35.6	45.38	-	-	74	-28.62	234	181	H
	* 3.603	38.68	MAv1	34.9	-35.6	37.98	54	-16.02	-	-	234	181	H
2	* 4.804	47.93	PK2	34	-35.1	46.83	-	-	74	-27.17	0	256	H
	* 4.804	40.09	MAv1	34	-35.1	38.99	54	-15.01	-	-	0	256	H
3	* 5.026	43.98	PK2	34.1	-34.2	43.88	-	-	74	-30.12	25	155	H
	* 5.026	32.28	MAv1	34.1	-34.2	32.18	54	-21.82	-	-	25	155	H
4	* 3.604	46.3	PK2	34.9	-35.6	45.6	-	-	74	-28.4	91	114	V
	* 3.603	38.97	MAv1	34.9	-35.6	38.27	54	-15.73	-	-	91	114	V
5	* 4.803	47.58	PK2	34	-35.1	46.48	-	-	74	-27.52	36	203	V
	* 4.804	40.28	MAv1	34	-35.1	39.18	54	-14.82	-	-	36	203	V
6	* 10.998	38.23	PK2	38.3	-27.8	48.73	-	-	74	-25.27	108	109	V
	* 11	27.33	MAv1	38.3	-27.8	37.83	54	-16.17	-	-	108	109	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average
- KDB558074 Option 1 Maximum RMS Average

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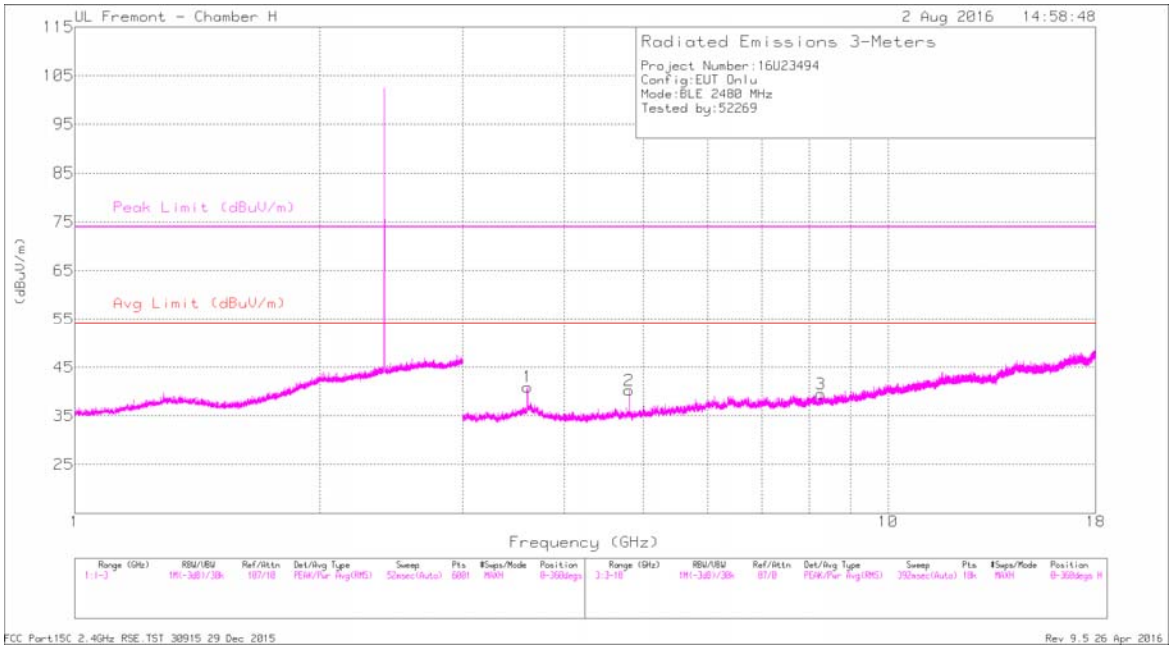
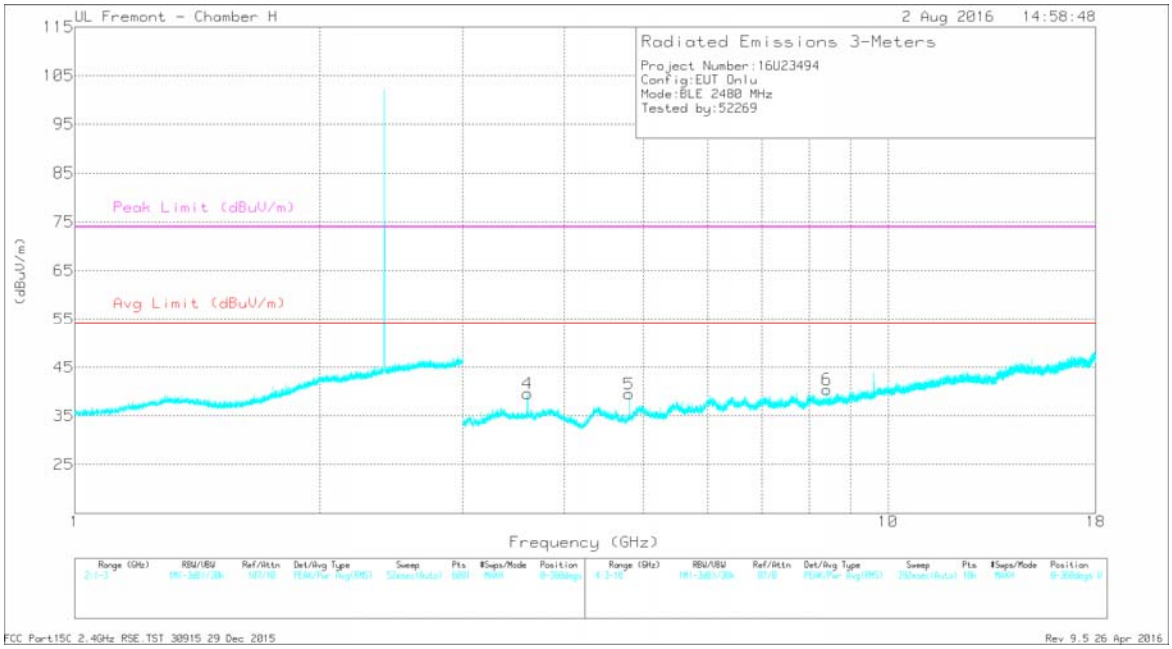
HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



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DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (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	* 3.603	46.8	PK2	34.9	-35.6	46.1	-	-	74	-27.9	53	193	H
	* 3.603	38.6	MAv1	34.9	-35.6	37.9	54	-16.1	-	-	53	193	H
2	* 4.805	46.86	PK2	34	-35.1	45.76	-	-	74	-28.24	162	160	H
	* 4.804	38.91	MAv1	34	-35.1	37.81	54	-16.19	-	-	162	160	H
3	* 8.262	39.23	PK2	35.8	-30.4	44.63	-	-	74	-29.37	148	337	H
	* 8.263	28.86	MAv1	35.8	-30.4	34.26	54	-19.74	-	-	148	337	H
4	* 3.603	46.21	PK2	34.9	-35.6	45.51	-	-	74	-28.49	271	100	V
	* 3.603	38.67	MAv1	34.9	-35.6	37.97	54	-16.03	-	-	271	100	V
5	* 4.804	47.23	PK2	34	-35.1	46.13	-	-	74	-27.87	225	226	V
	* 4.804	39.63	MAv1	34	-35.1	38.53	54	-15.47	-	-	225	226	V
6	* 8.403	39.8	PK2	35.8	-30.1	45.5	-	-	74	-28.5	185	208	V
	* 8.404	29.21	MAv1	35.8	-30.1	34.91	54	-19.09	-	-	185	208	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

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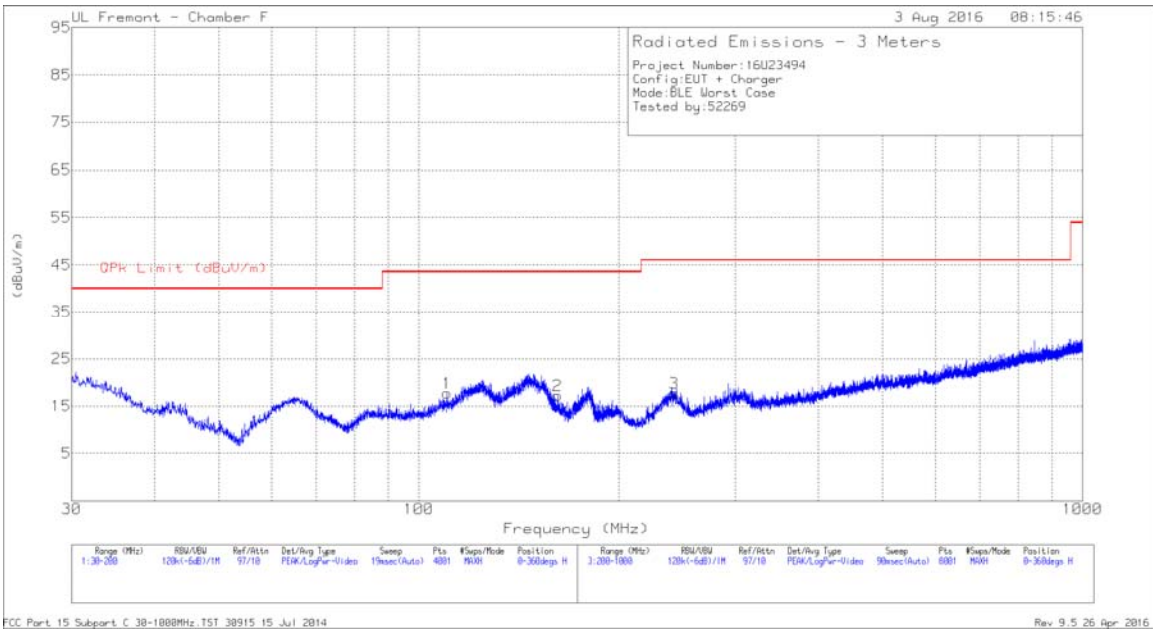
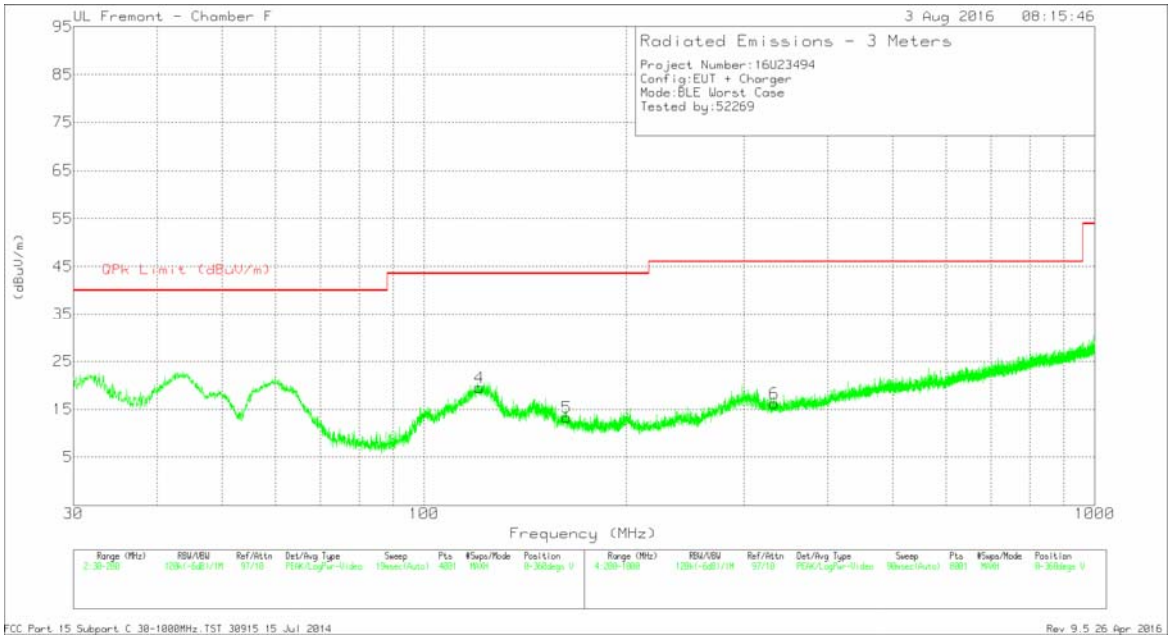
8.3. WORST-CASE BELOW 1 GHz

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 T185 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 110.24	32.46	Pk	16.4	-31.1	17.76	43.52	-25.76	0-360	199	H
2	161.835	31.82	Pk	16.1	-30.7	17.22	43.52	-26.3	0-360	99	H
4	* 120.95	32.45	Pk	18	-31	19.45	43.52	-24.07	0-360	100	V
5	* 163.195	27.91	Pk	16.1	-30.7	13.31	43.52	-30.21	0-360	100	V
3	* 242.6	32.29	Pk	15.6	-30.2	17.69	46.02	-28.33	0-360	99	H
6	* 333.1	27.91	Pk	18	-29.7	16.21	46.02	-29.81	0-360	201	V

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

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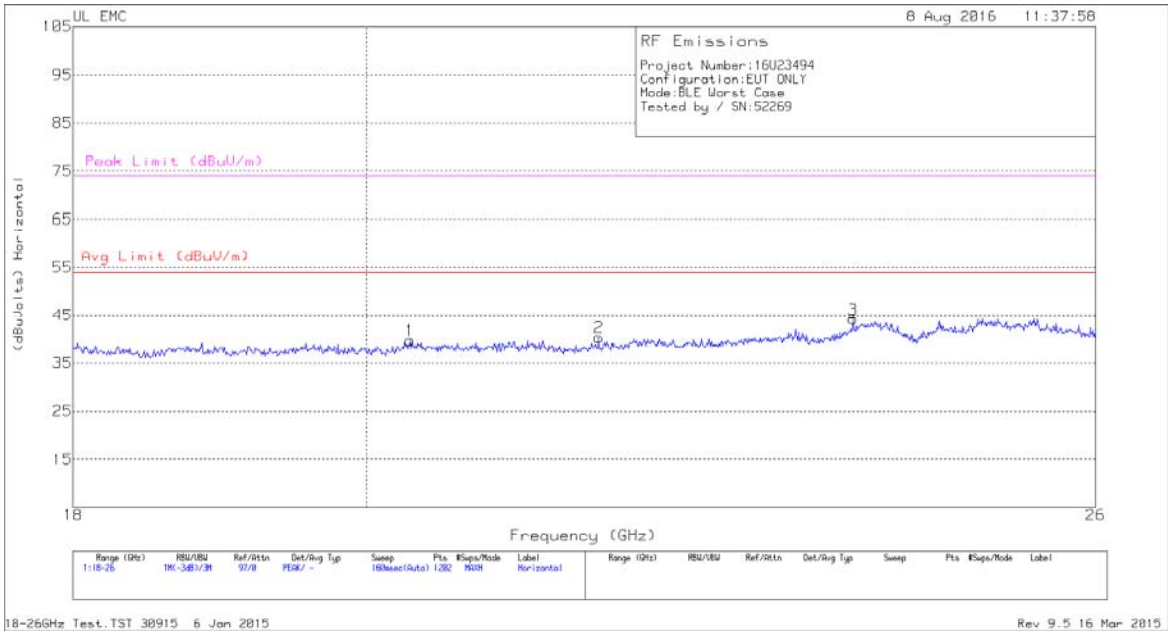
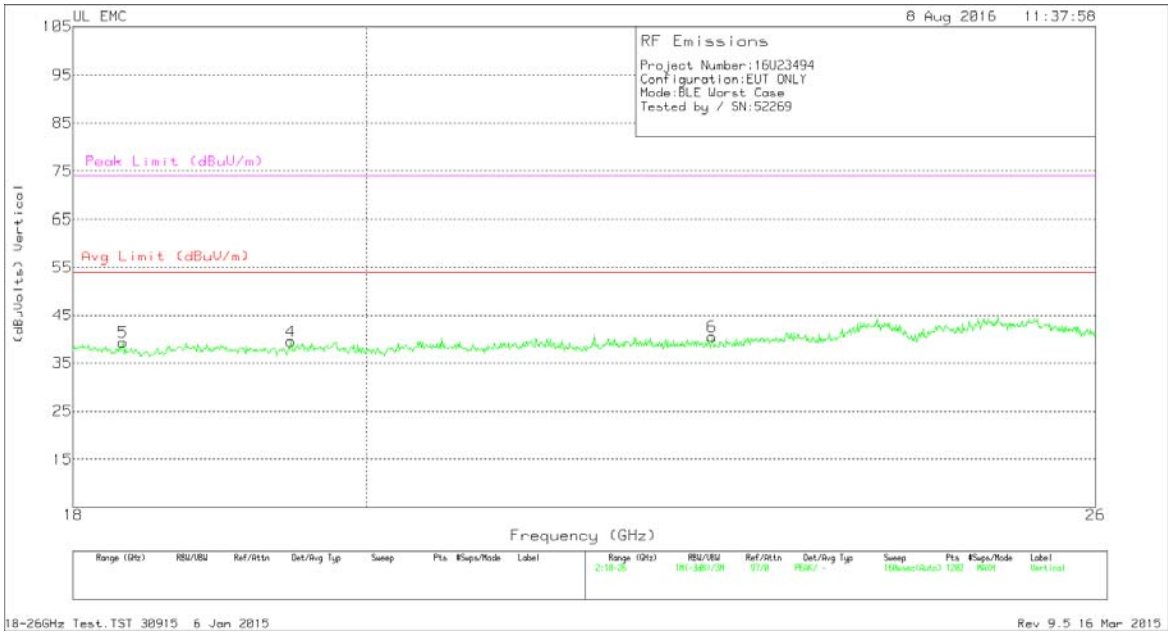
8.4. WORST-CASE 18 to 26 GHz

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	AF T449 (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	20.318	41.77	Pk	32.8	-25.4	-9.5	39.67	54	-14.33	74	-34.33
2	21.744	41.53	Pk	33.2	-24.9	-9.5	40.33	54	-13.67	74	-33.67
3	23.828	43.97	Pk	33.9	-24.2	-9.5	44.17	54	-9.83	74	-29.83
4	19.465	41	Pk	32.7	-24.7	-9.5	39.5	54	-14.5	74	-34.5
5	18.326	41.73	Pk	32.4	-25.3	-9.5	39.33	54	-14.67	74	-34.67
6	22.649	41.7	Pk	33.4	-25.1	-9.5	40.5	54	-13.5	74	-33.5

Pk - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
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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.

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

6 WORST EMISSIONS

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Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables 1&3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
1	.17025	45.78	Qp	0	0	10.1	55.88	64.95	-9.07	-	-
2	.17025	30.7	Ca	0	0	10.1	40.8	-	-	54.95	-14.15
3	.25575	41.22	Qp	0	0	10.1	51.32	61.57	-10.25	-	-
4	.258	25.56	Ca	0	0	10.1	35.66	-	-	51.5	-15.84
5	.76425	30.85	Qp	0	0	10.1	40.95	56	-15.05	-	-
6	.7665	16.59	Ca	0	0	10.1	26.69	-	-	46	-19.31
7	1.0185	24.52	Qp	0	0	10.1	34.62	56	-21.38	-	-
8	1.02975	9.64	Ca	0	0	10.1	19.74	-	-	46	-26.26
9	5.748	20.27	Qp	0	.1	10.1	30.47	60	-29.53	-	-
10	5.74575	13.27	Ca	0	.1	10.1	23.47	-	-	50	-26.53
11	18.22538	19.66	Qp	0	.2	10.3	30.16	60	-29.84	-	-
12	18.22875	9.28	Ca	0	.2	10.3	19.78	-	-	50	-30.22

Qp - Quasi-Peak detector

Ca - CISPR average detection

Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables 2&3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
13	.17025	46.35	Qp	0	0	10.1	56.45	64.95	-8.5	-	-
14	.17025	31.77	Ca	0	0	10.1	41.87	-	-	54.95	-13.08
15	.25575	41.17	Qp	0	0	10.1	51.27	61.57	-10.3	-	-
16	.25575	26.62	Ca	0	0	10.1	36.72	-	-	51.57	-14.85
17	.762	28.83	Qp	0	0	10.1	38.93	56	-17.07	-	-
18	.76425	19.97	Ca	0	0	10.1	30.07	-	-	46	-15.93
19	1.01625	22.65	Qp	0	0	10.1	32.75	56	-23.25	-	-
20	1.0275	12.56	Ca	0	0	10.1	22.66	-	-	46	-23.34
21	5.7795	19.51	Qp	0	.1	10.2	29.81	60	-30.19	-	-
22	5.757	12.57	Ca	0	.1	10.2	22.87	-	-	50	-27.13
23	18.33675	20.67	Qp	0	.2	10.3	31.17	60	-28.83	-	-
24	18.33675	14.5	Ca	0	.2	10.3	25	-	-	50	-25

Qp - Quasi-Peak detector

Ca - CISPR average detection

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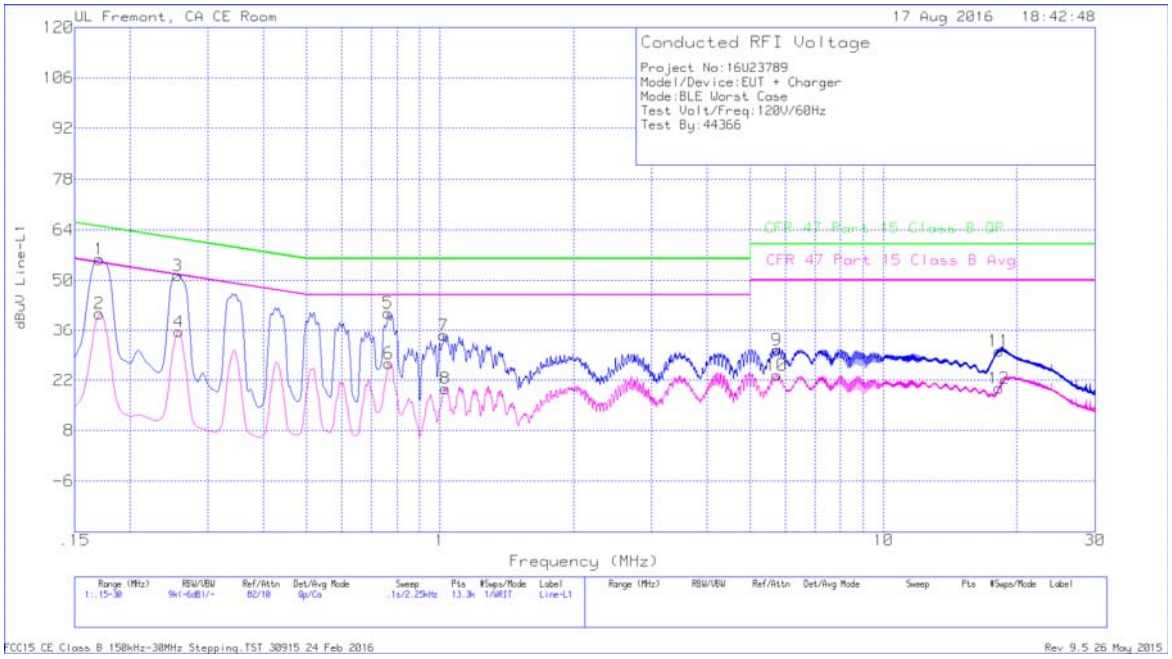
LINE 1 RESULTS



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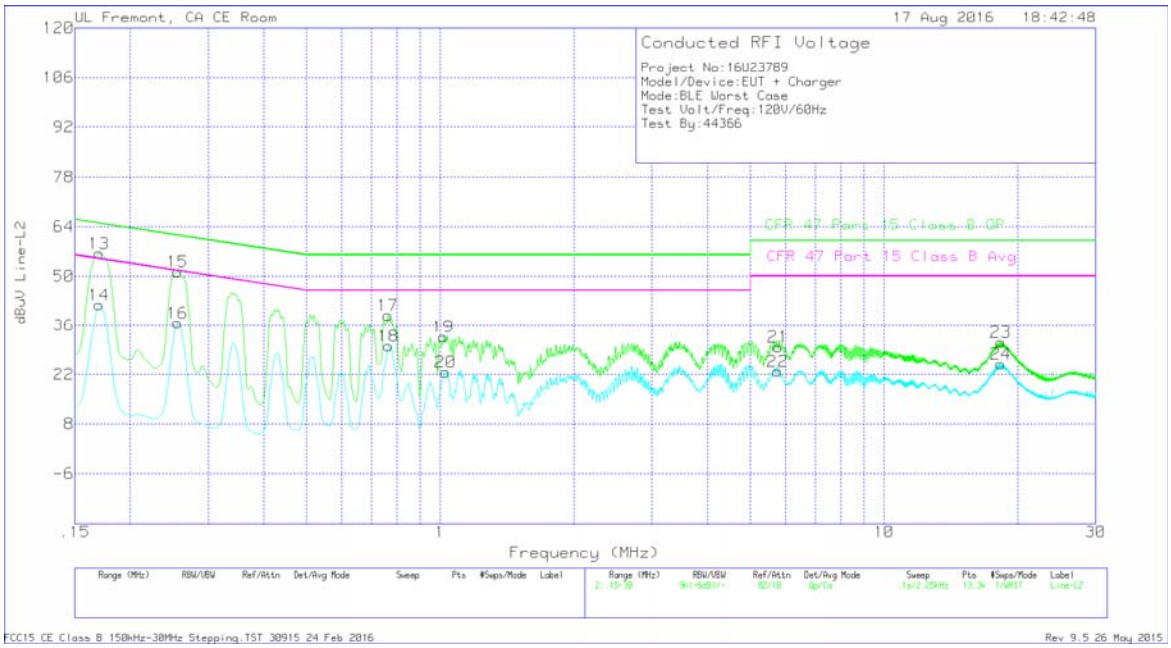
LINE 2 RESULTS



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