FCC 47 CFR PART 15 SUBPART C

BLUETOOTH LOW ENERGY CERTIFICATION TEST REPORT

FOR

WIRELESS DEVICE

MODEL NUMBER: A1846

FCC ID: BCGA1846

REPORT NUMBER: 16U23820-E1V3

ISSUE DATE: JANUARY 03, 2017

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

Prepared by
UL VERIFICATION SERVICES INC.
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	12/05/2016	Initial Issue	Mengistu Mekuria
V2	1/03/2017	Address TCB's Question	Chin Pang
V3	1/03/2017	Address TCB's Question	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 DEVICE

MODEL: A1846

SERIAL NUMBER: 3137

DATE TESTED: NOVEMBER 03 - 09, 2016

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	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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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.

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	3.84 dB
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
Radiated Disturbance,26000 to 40000 MHz	5.24 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 wireless device with BLE and NFC capability

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	3.21	2.09

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Gain (dBi)
2.4	-2.64

5.4. SOFTWARE AND FIRMWARE

The BLE firmware version 10.31 and testing was performed with Nordic BLE python script.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission below 1GHz, from 18 to 26GHz, and power line conducted emission tests 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 under three orthogonal orientations X (Flatbed), Y (Landscape), and Z (Portrait). Y orientation was determined to be the worst-case orientation. Therefore, all final radiated testing was performed with the EUT in Y orientation.

Worst-case data rates as provided by the client were:

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	Apple	MacBook Pro	73043BDQAGU	N/A
DC power supply	Sorensen	XT 15-4	1319A02779	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	DC	1	4 pins connector	Un-Shielded	1	N/A
2	Antenna	1	Spectrum Analyzer	Un-Shielded	0.1	N/A
3	USB	1	Laptop	Un-Shielded	1	N/A

I/O CABLES (RADIATED BELOW AND ABOVE 1 GHZ)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC	1	4 pins connector	Un-Shielded	1	N/A
2	AC	1	AC	Un-shielded	3	N/A

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

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC	1	DC	Un-shielded	1	N/A
2	AC	1	AC	Un-shielded	3	N/A

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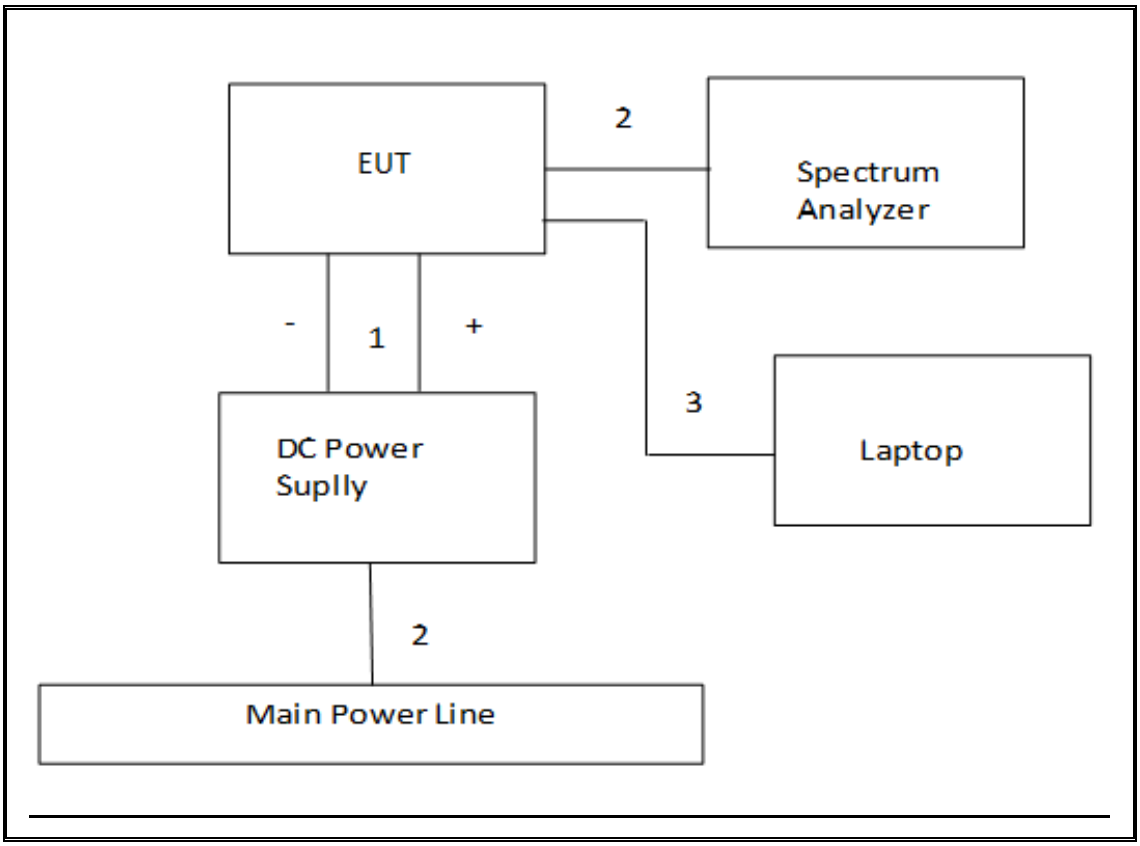
TEST SETUP- CONDUCTED PORT

SETUP DIAGRAM



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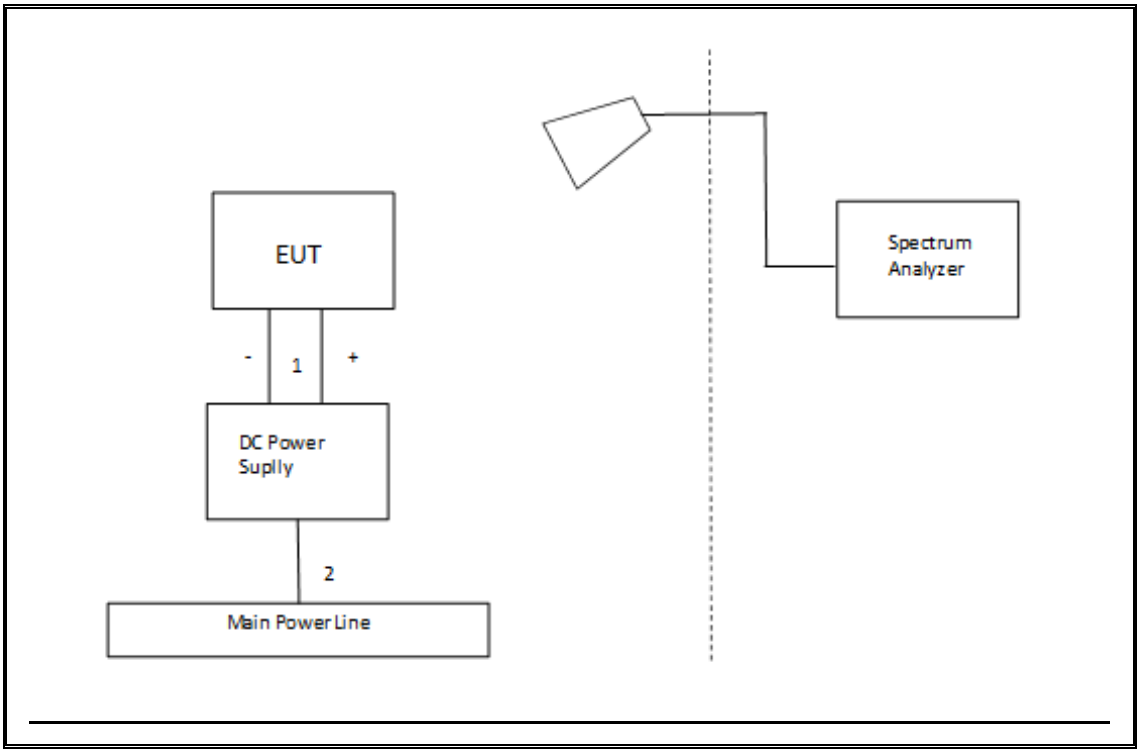
TEST SETUP- RADIATED-ABOVE 1 GHZ

SETUP DIAGRAM



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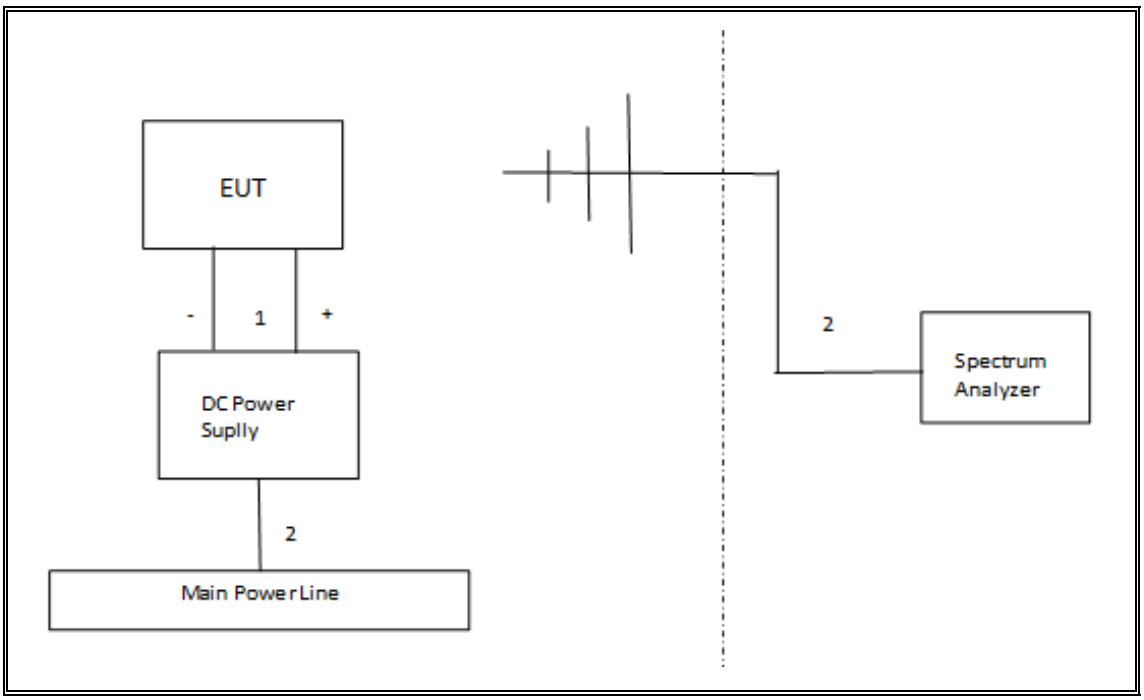
TEST SETUP- BELOW 1GHz

SETUP DIAGRAM



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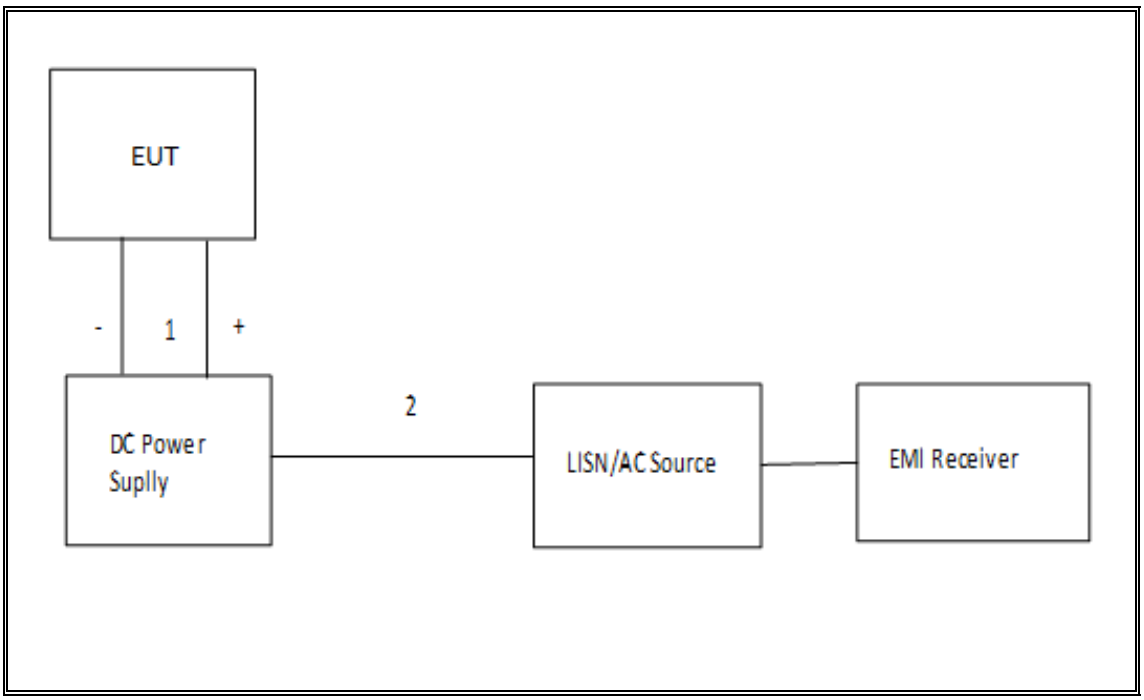
AC LINE SETUP DIAGRAM



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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**	**Asset**	**Cal Due**
Antenna, Horn 1-18GHz	ETS Lindgren	3117	00143449	4/5/2017
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	A022813-1	1/29/2017
Amplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	1782158	1/25/2017
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	185623	6/17/2017
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	MY51380907	9/22/2017
Power Meter, P-series single channel	Keysight	N1911A	MY53060010	3/17/2017
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight	N1921A	MY53260010	6/20/2017
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826	1049	6/6/2017
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Keysight	8449B	3008A04710	7/5/2017
AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	100935	9/13/2017
LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2	161124	6/8/2017
**Power Cable, Line Conducted Emissions	U L	PG1	N/A	9/1/2017
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

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

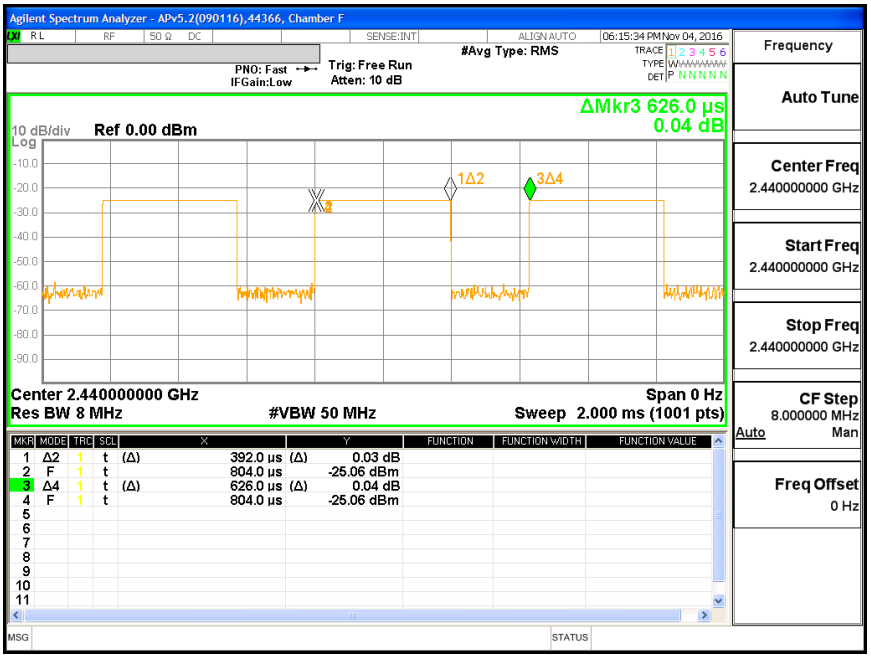
KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
BLE	0.392	0.626	0.626	62.62%	2.03	2.551

DUTY CYCLE PLOTS

DUTY CYCLE BLE MODE



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7.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

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

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.688	0.5
Middle	2440	0.686	0.5
High	2480	0.686	0.5

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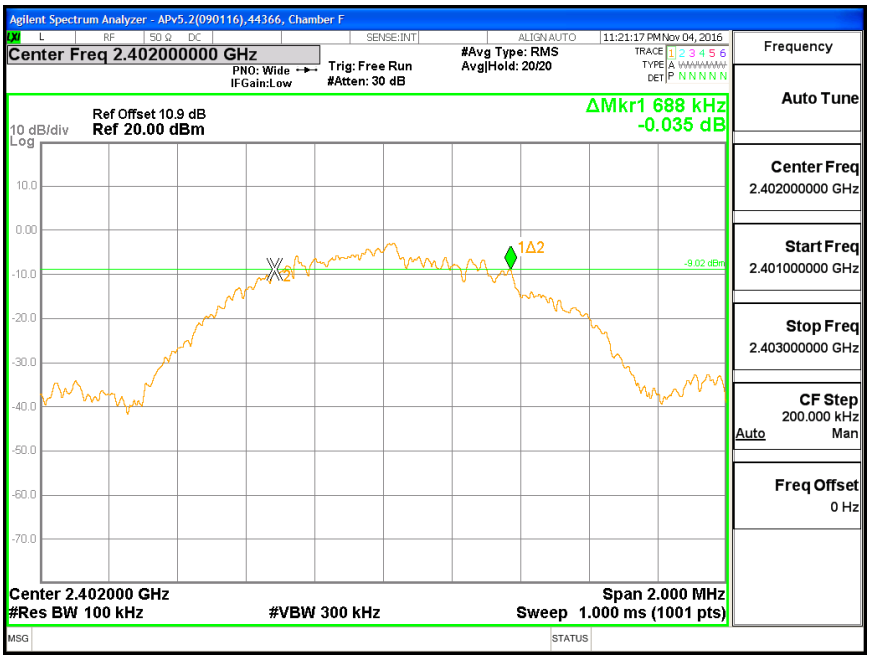
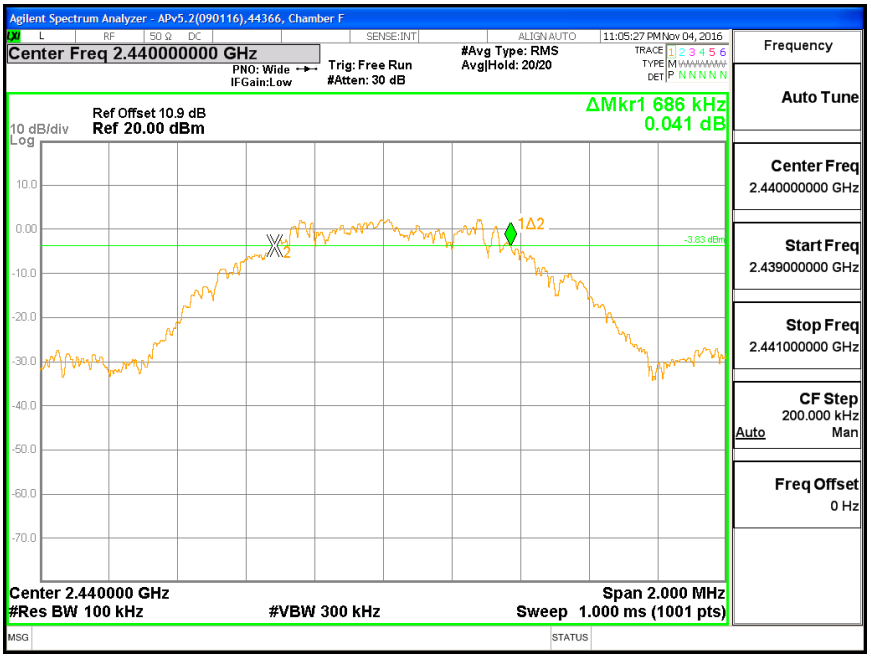
6 dB BANDWIDTH

6 dB BANDWIDTH LOW CH



6 dB BANDWIDTH MID CH



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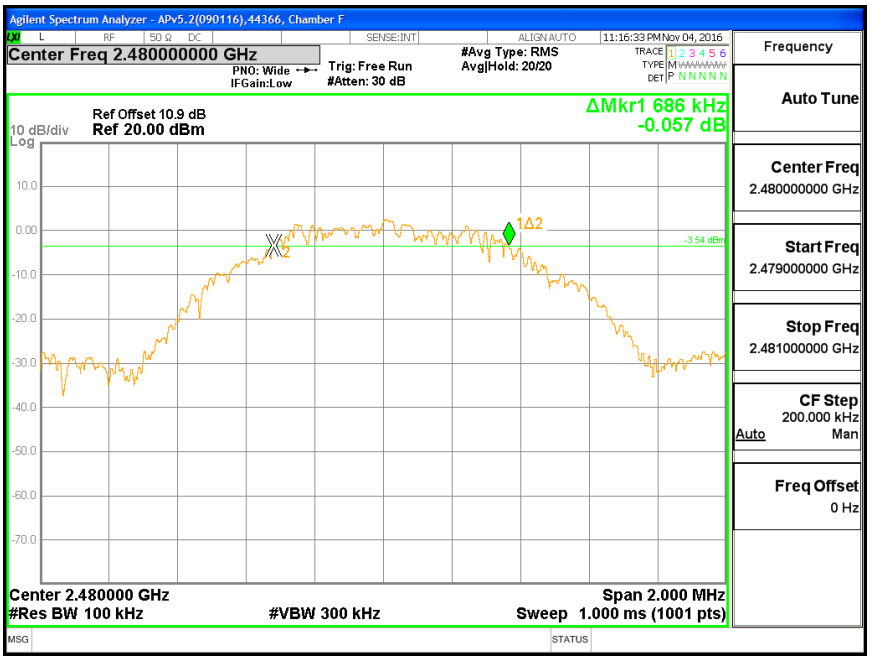
6 dB BANDWIDTH HIGH CH



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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	1.0458
Middle	2440	1.0489
High	2480	1.0468

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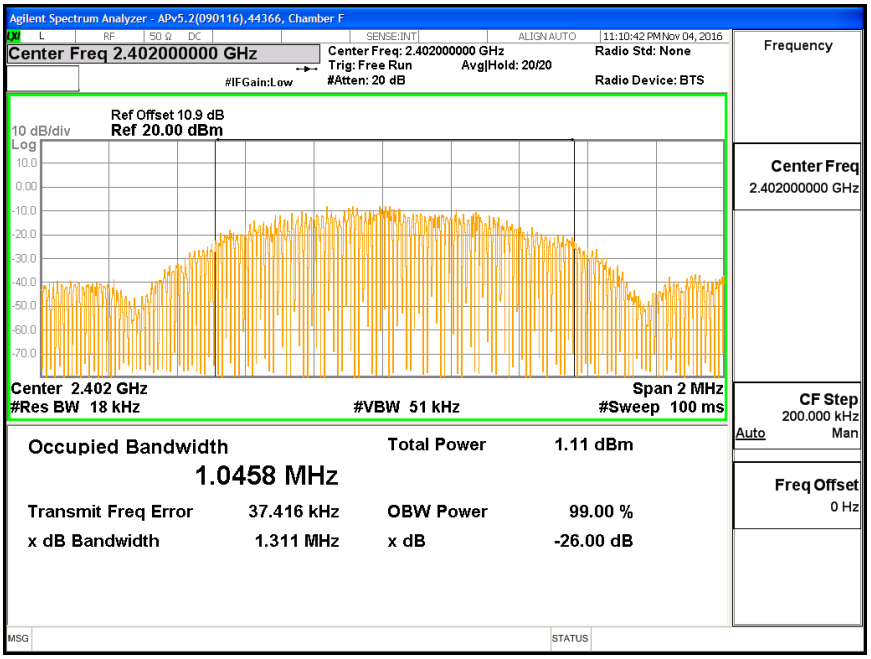
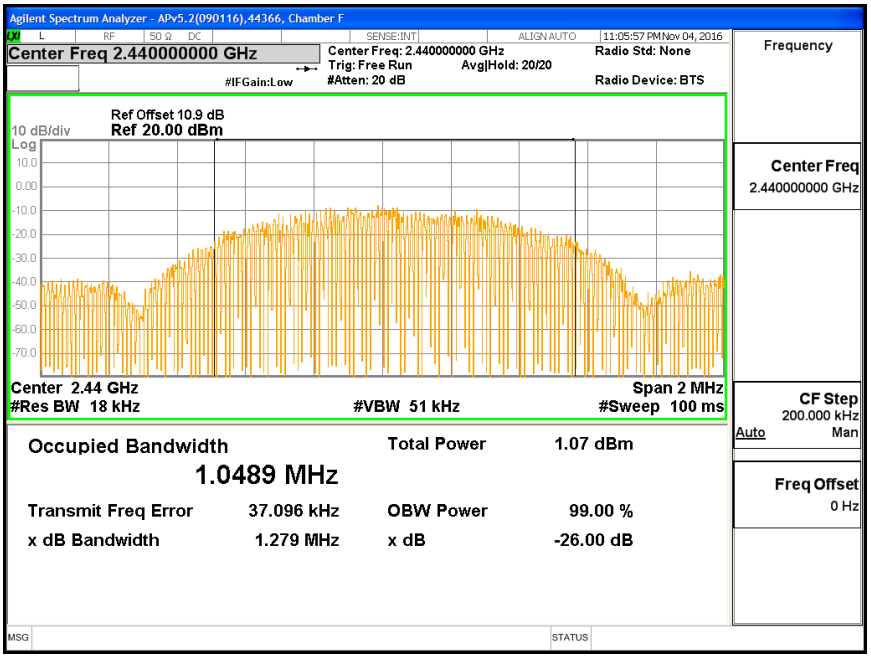
99% BANDWIDTH

99% BANDWIDTH LOW CH



99% BANDWIDTH MID CH



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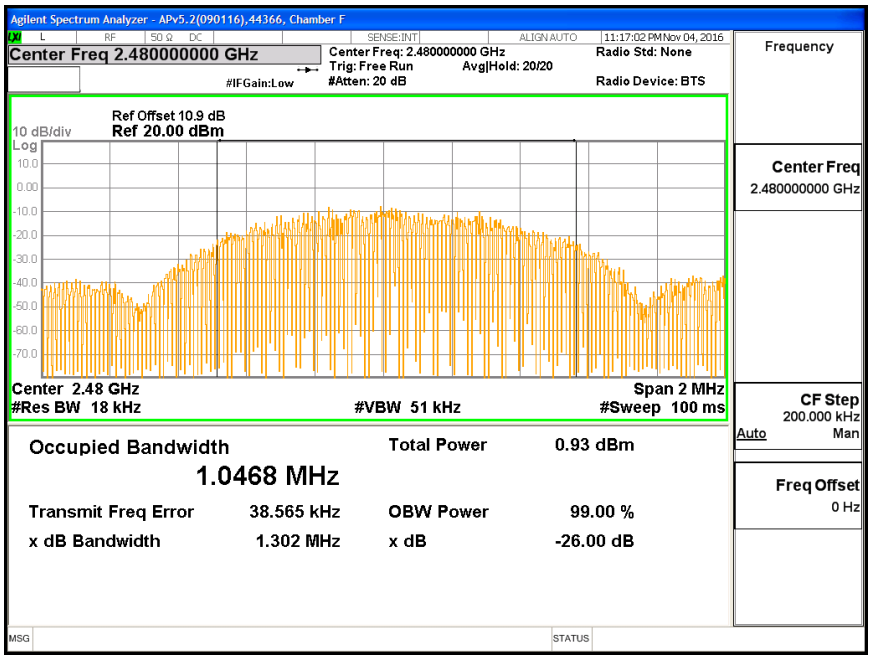
99% BANDWIDTH HIGH CH



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7.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a wideband gated 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:	44366	Date:	11/4/16

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	3.07
Middle	2440	3.01
High	2480	2.90

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7.6. OUTPUT POWER

LIMITS

FCC §15.247 (b)

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 wideband power meter.

RESULTS

ID:	44366	Date:	11/4/16

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	3.21	30	-26.790
Middle	2440	3.15	30	-26.850
High	2480	3.05	30	-26.950

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7.7. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

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	-12.171	8	-20.17
Middle	2440	-12.244	8	-20.24
High	2480	-12.421	8	-20.42

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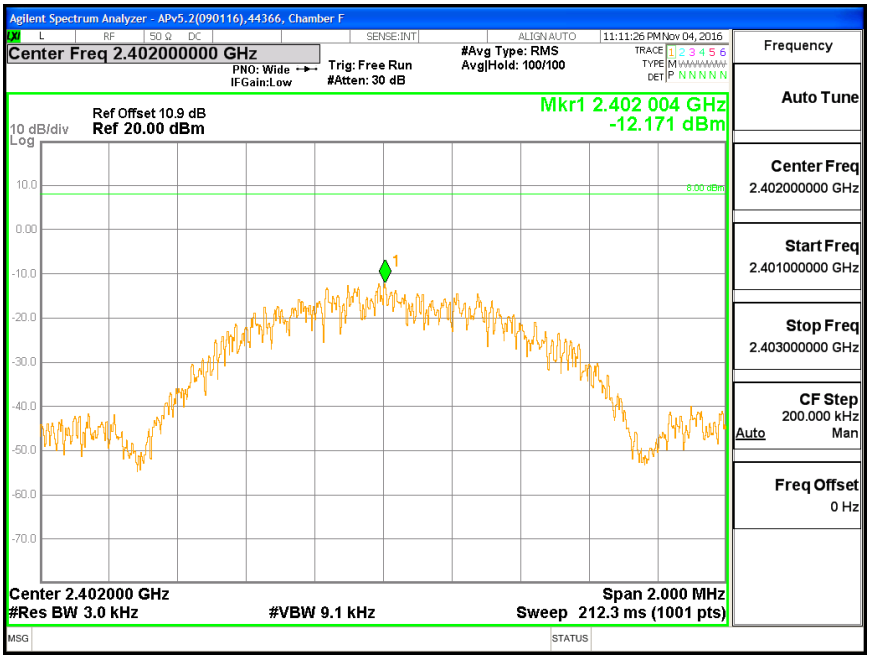
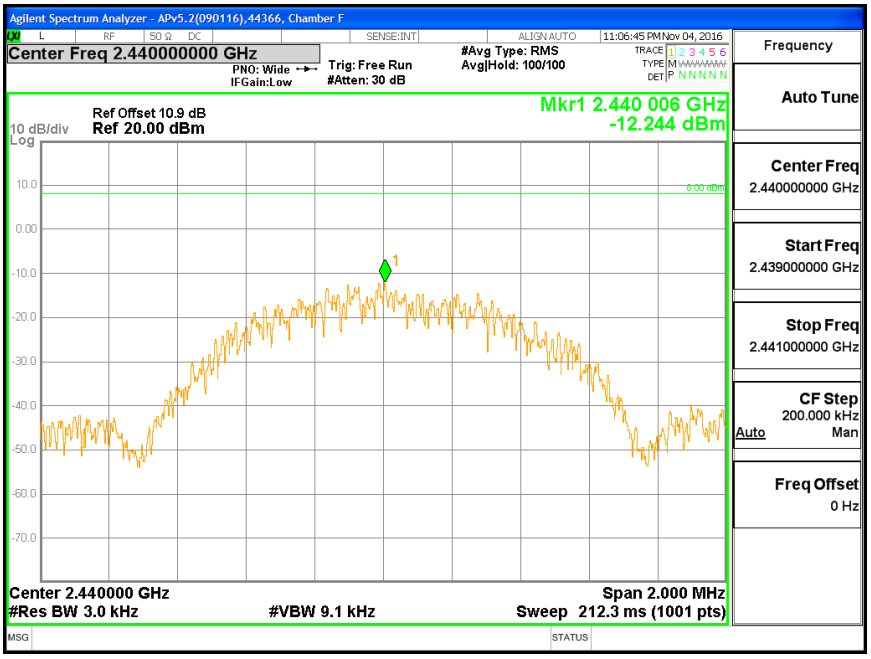
POWER SPECTRAL DENSITY

PSD LOW CH



PSD MID CH



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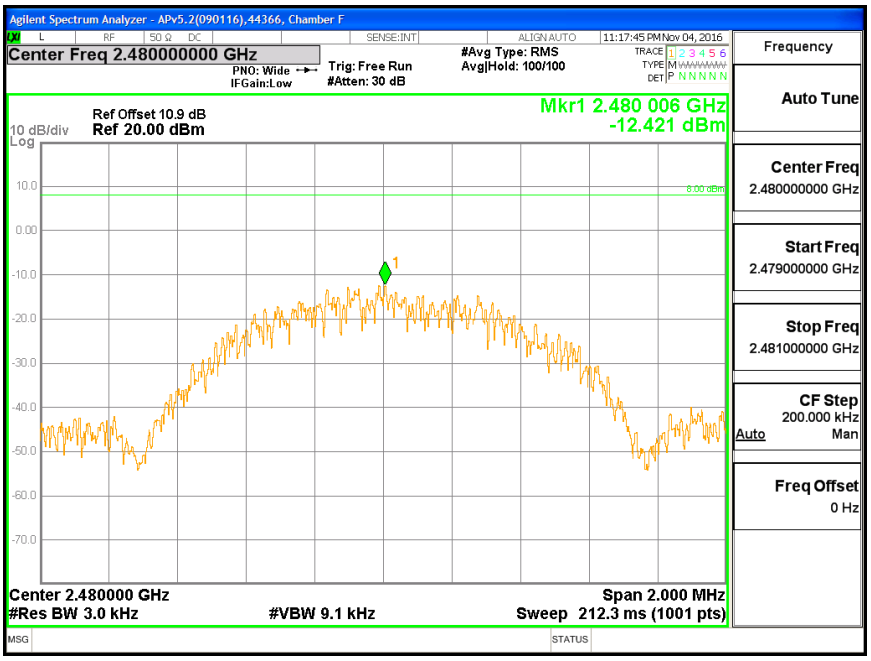
PSD HIGH CH



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7.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

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

RESULTS

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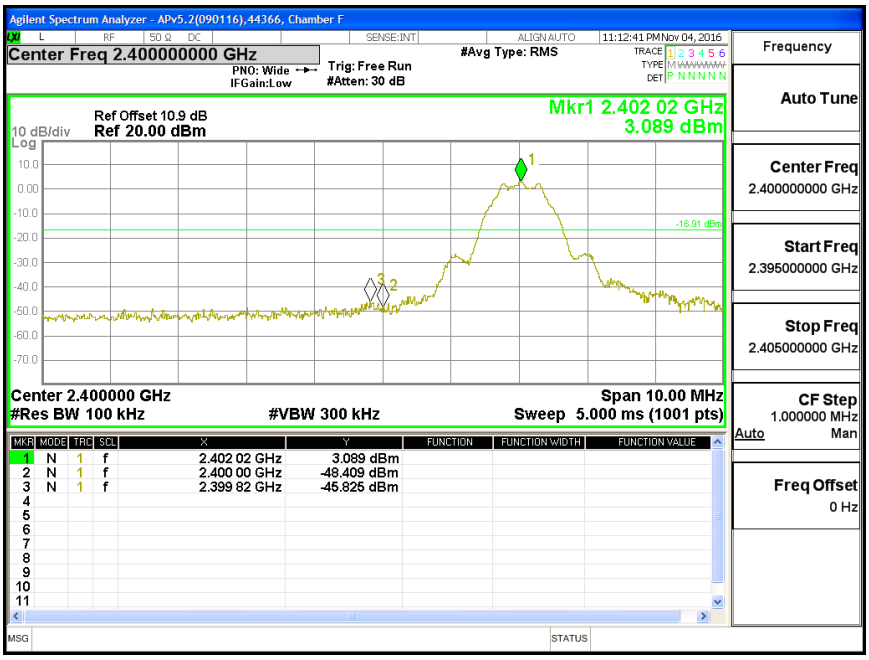
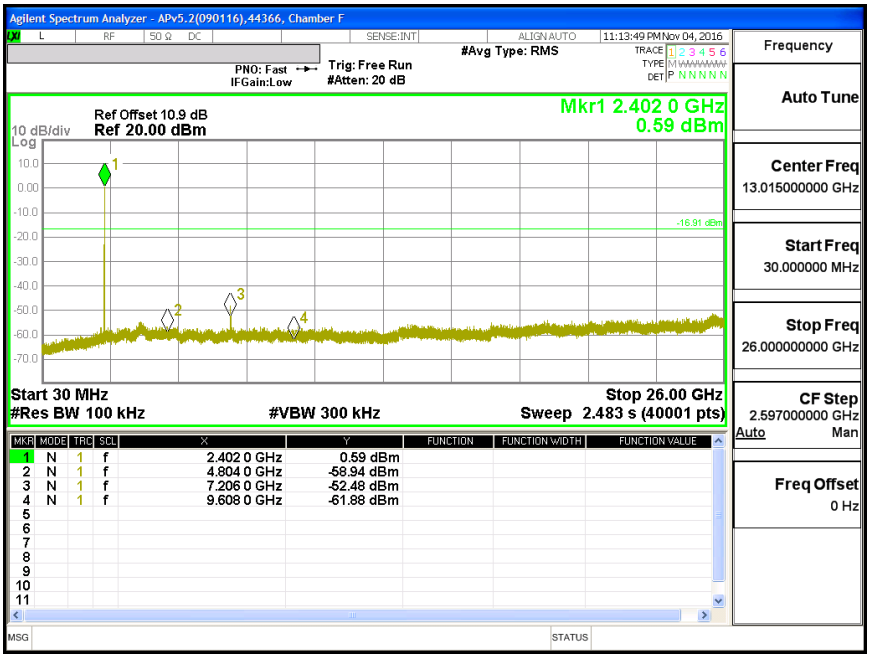
SPURIOUS EMISSIONS, LOW CHANNEL

LOW CH BANDEDGE



LOW CH SPURIOUS



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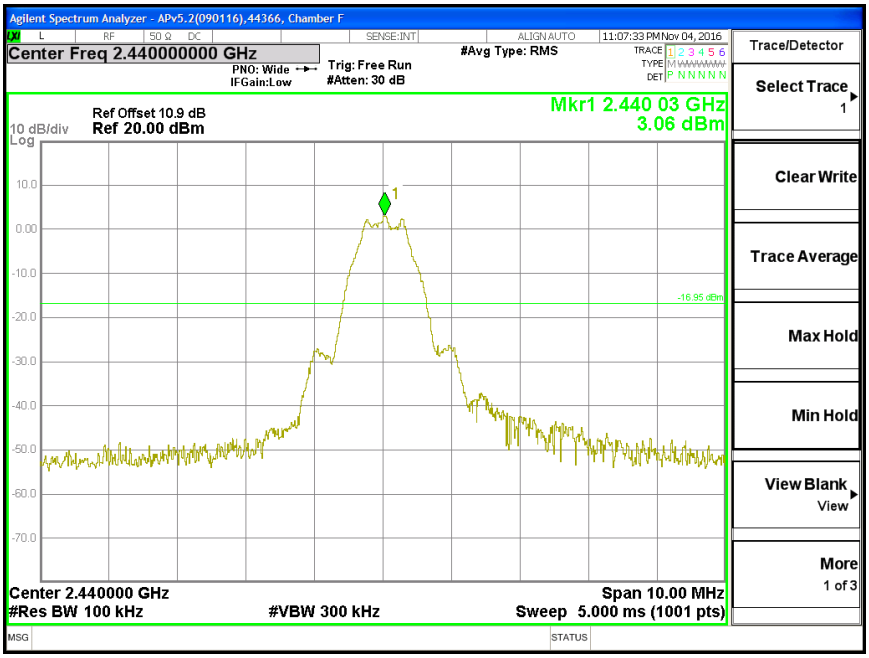
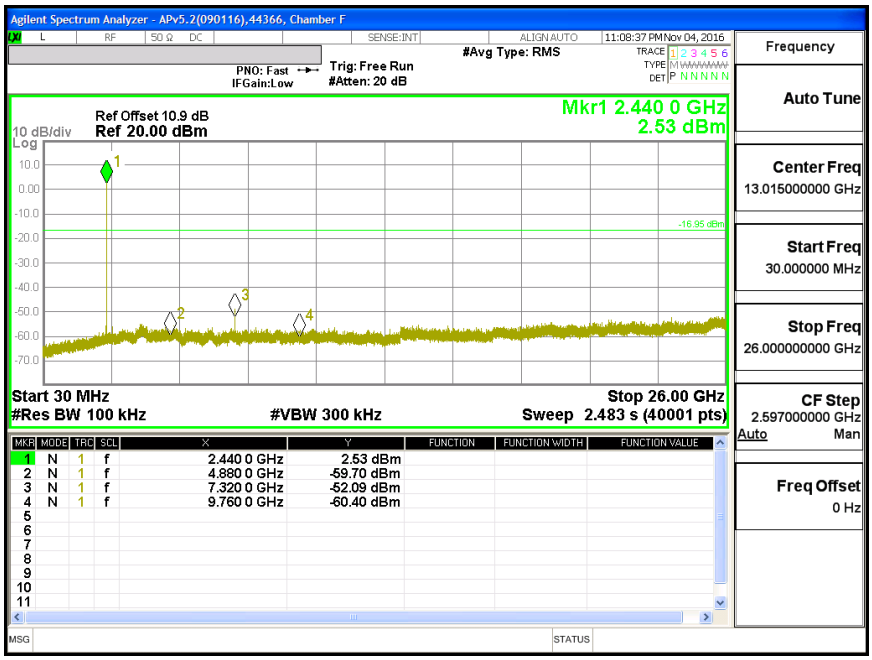
SPURIOUS EMISSIONS, MID CHANNEL

MID CH REFERENCE



MID CH SPURIOUS



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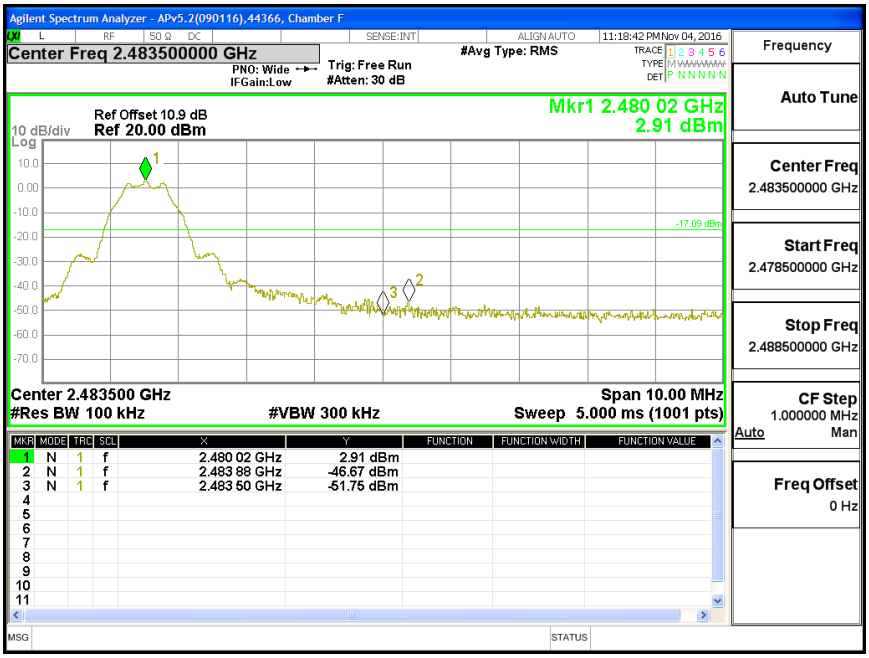
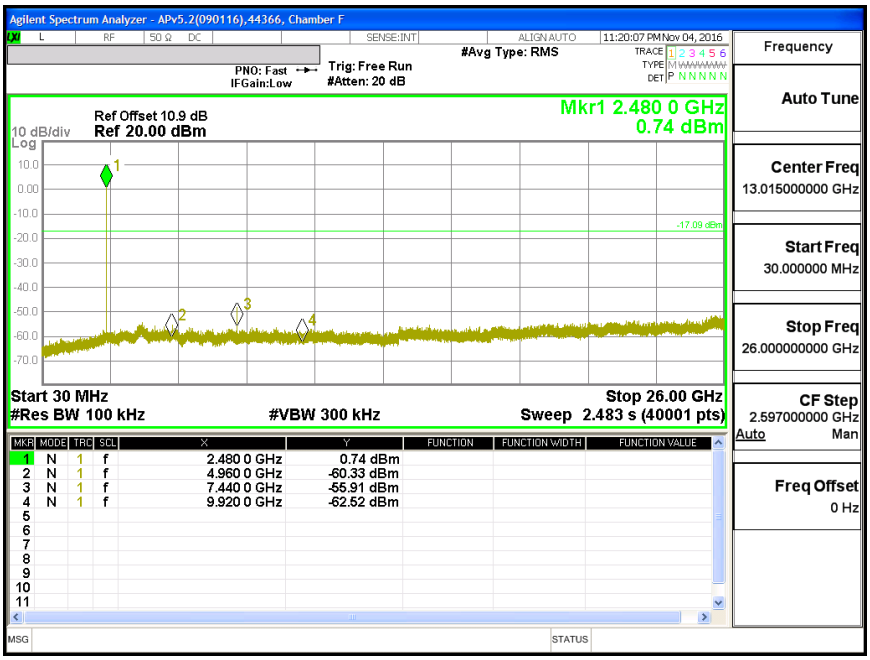
SPURIOUS EMISSIONS, HIGH CHANNEL

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

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 final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable 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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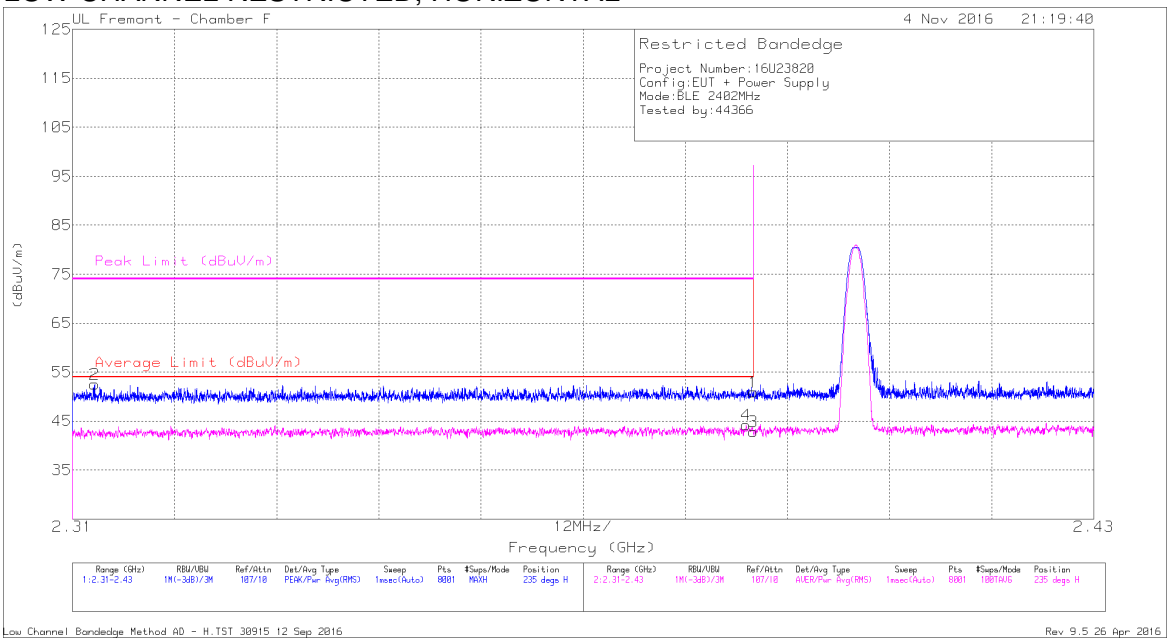
8.2. TRANSMITTER ABOVE 1 GHz

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)	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	39.66	Pk	32.1	-20.9	0	50.86	-	-	74	-23.14	235	369	H
2	* 2.313	41.73	Pk	31.7	-20.9	0	52.53	-	-	74	-21.47	235	369	H
3	* 2.39	29.66	RMS	32.1	-20.9	2.03	42.89	54	-11.11	-	-	235	369	H
4	* 2.389	31	RMS	32.1	-20.9	2.03	44.23	54	-9.77	-	-	235	369	H

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

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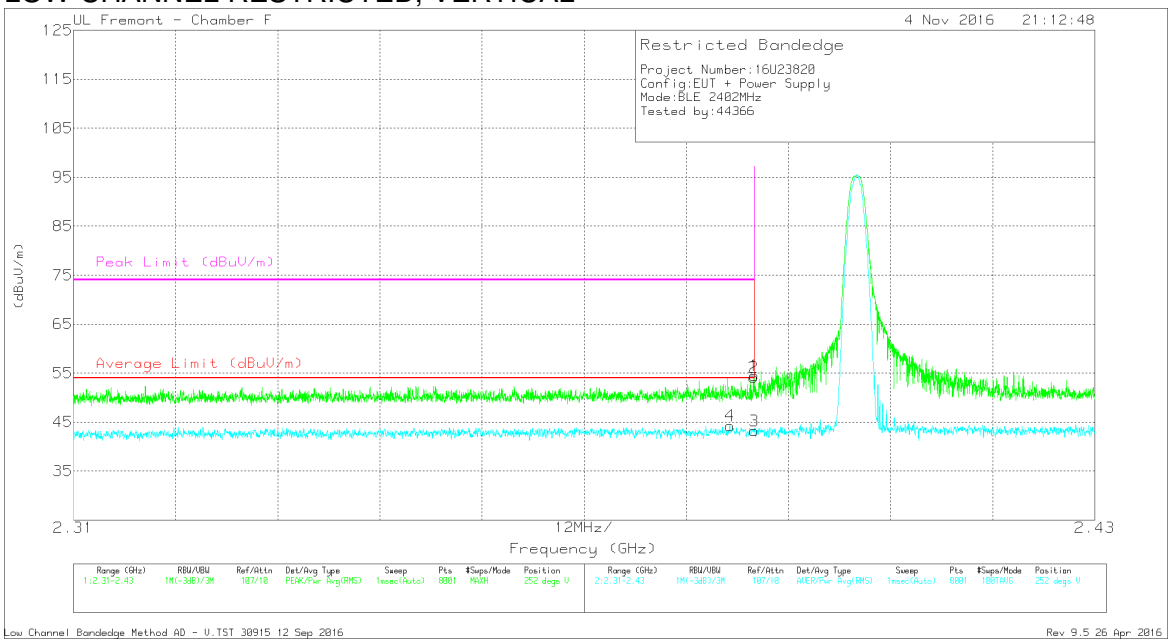
LOW CHANNEL RESTRICTED, VERTICAL



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/ Pad (dB)	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	43.31	Pk	32.1	-20.9	0	54.51	-	-	74	-19.49	252	131	V
2	* 2.39	42.98	Pk	32.1	-20.9	0	54.18	-	-	74	-19.82	252	131	V
3	* 2.39	30.01	RMS	32.1	-20.9	2.03	43.24	54	-10.76	-	-	252	131	V
4	* 2.387	31.04	RMS	32.1	-20.9	2.03	44.27	54	-9.73	-	-	252	131	V

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

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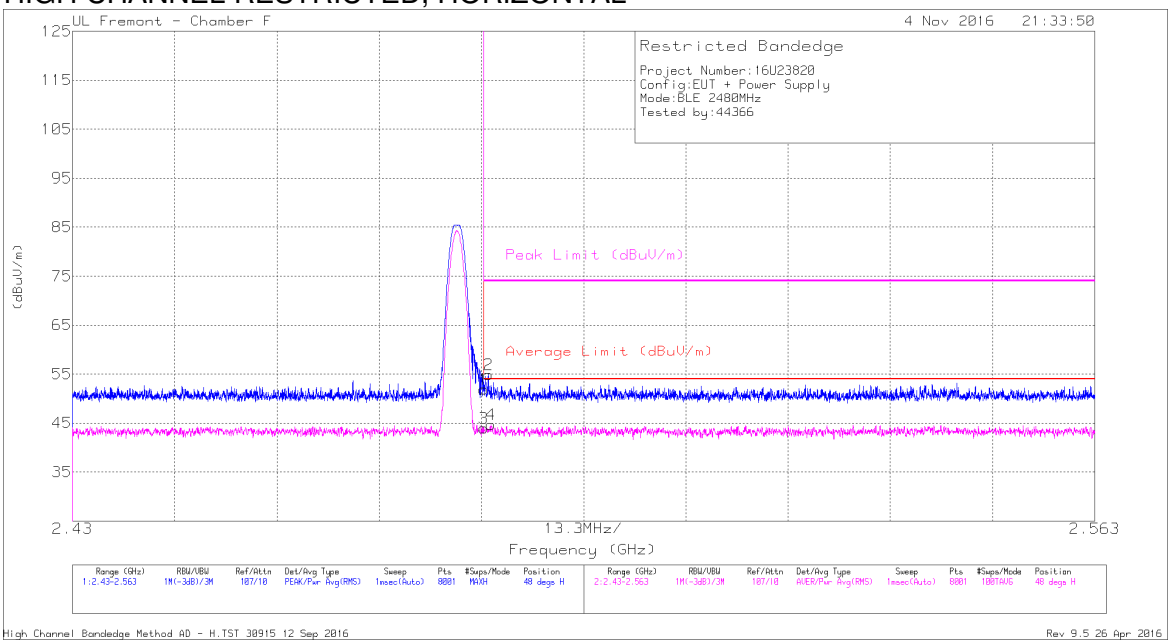
HIGH CHANNEL RESTRICTED, HORIZONTAL



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	40.66	Pk	32.3	-21	0	51.96	-	-	74	-22.04	48	329	H
2	* 2.484	43.61	Pk	32.3	-21	0	54.91	-	-	74	-19.09	48	329	H
3	* 2.484	30.6	RMS	32.3	-21	2.03	43.93	54	-10.07	-	-	48	329	H
4	* 2.484	31.3	RMS	32.3	-20.9	2.03	44.73	54	-9.27	-	-	48	329	H

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

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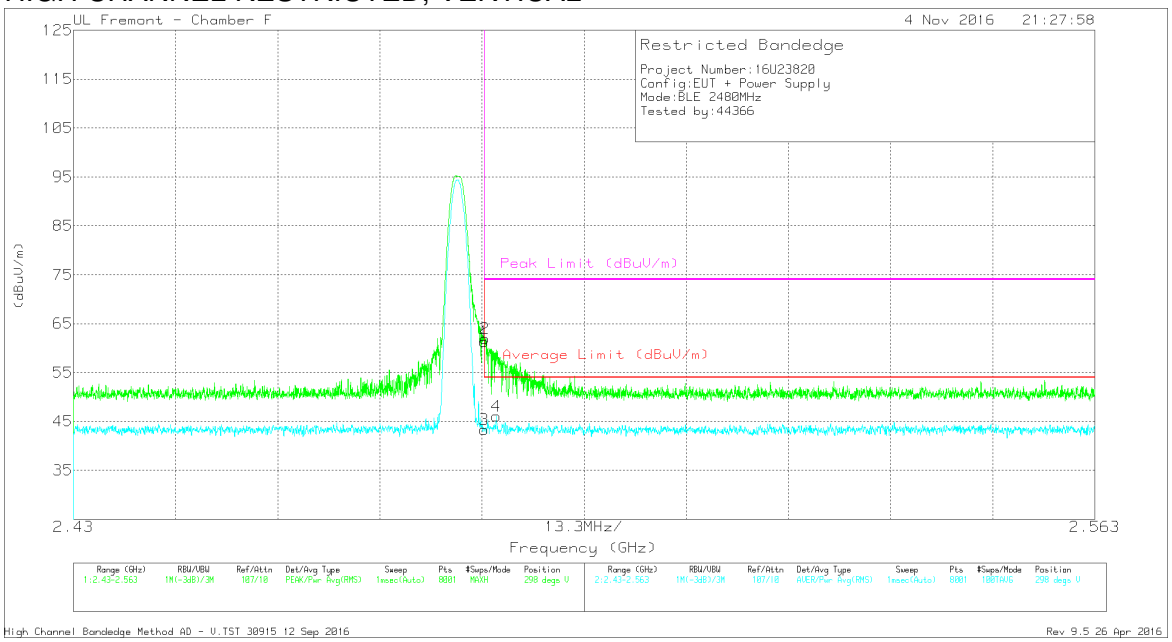
HIGH CHANNEL RESTRICTED, VERTICAL



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	50.08	Pk	32.3	-21	0	61.38	-	-	74	-12.62	298	280	V
2	* 2.484	50.66	Pk	32.3	-21	0	61.96	-	-	74	-12.04	298	280	V
3	* 2.484	30	RMS	32.3	-21	2.03	43.33	54	-10.67	-	-	298	280	V
4	* 2.485	32.6	RMS	32.3	-20.9	2.03	46.03	54	-7.97	-	-	298	280	V

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

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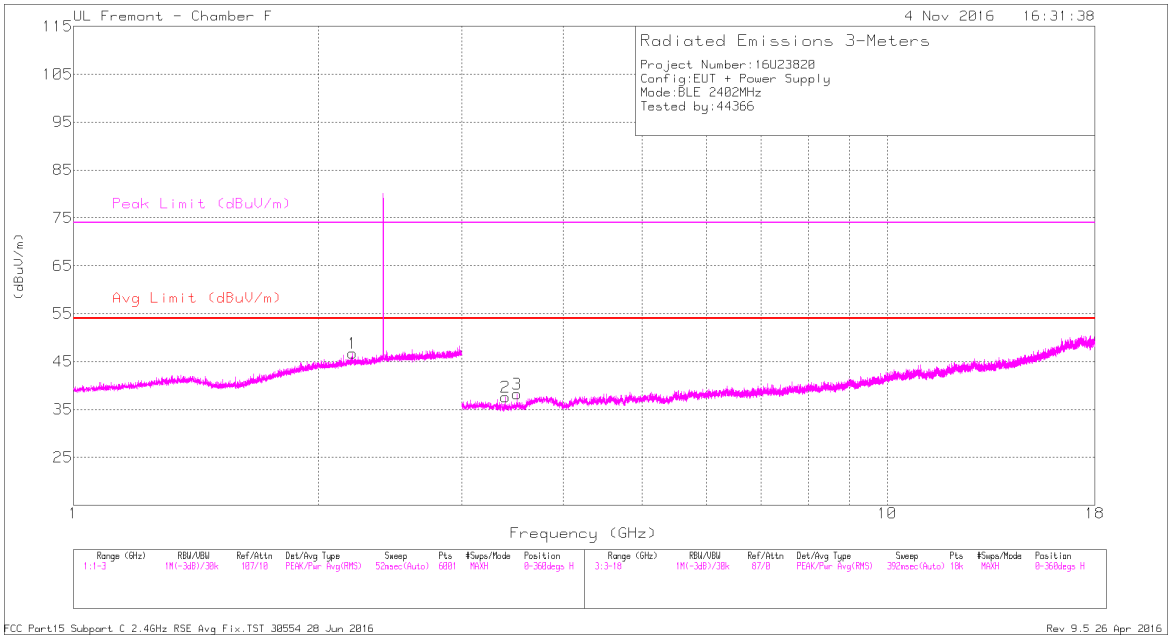
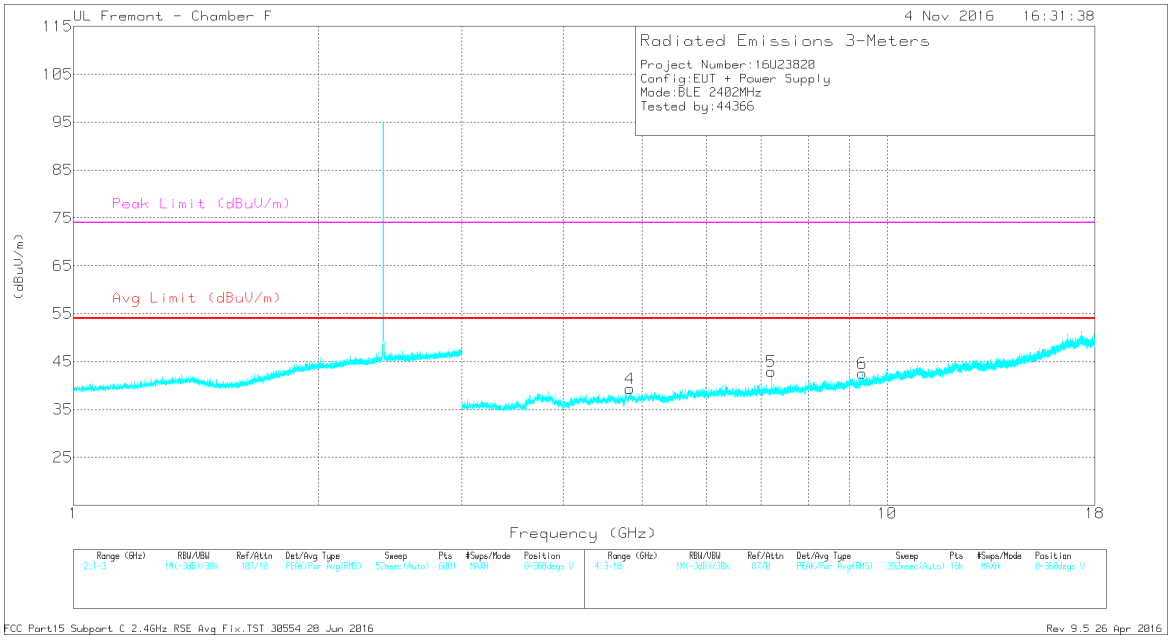
8.2.2. HARMONICS AND SPURIOUS EMISSIONS

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
1	* 2.204	41.69	PK2	31.9	-21.1	0	52.49	-	-	74	-21.51	313	106	H
	* 2.203	30.45	MAv1	31.9	-21	2.03	43.38	54	-10.62	-	-	313	106	H
2	3.394	39.69	PK2	32.9	-29.5	0	43.09	-	-	-	-	344	148	H
3	* 3.512	40.04	PK2	32.9	-28.3	0	44.64	-	-	74	-29.36	0	301	H
	* 3.511	28	MAv1	32.9	-28.3	2.03	34.63	54	-19.37	-	-	0	301	H
4	* 4.83	37.25	PK2	34	-27.1	0	44.15	-	-	74	-29.85	28	209	V
	* 4.831	26.08	MAv1	34	-27.1	2.03	35.01	54	-18.99	-	-	28	209	V
5	7.205	39.82	PK2	35.6	-26.4	0	49.02	-	-	-	-	259	195	V
6	* 9.313	34.11	PK2	36.3	-22.4	0	48.01	-	-	74	-25.99	108	152	V
	* 9.318	23.27	MAv1	36.3	-22.4	2.03	39.2	54	-14.8	-	-	108	152	V

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

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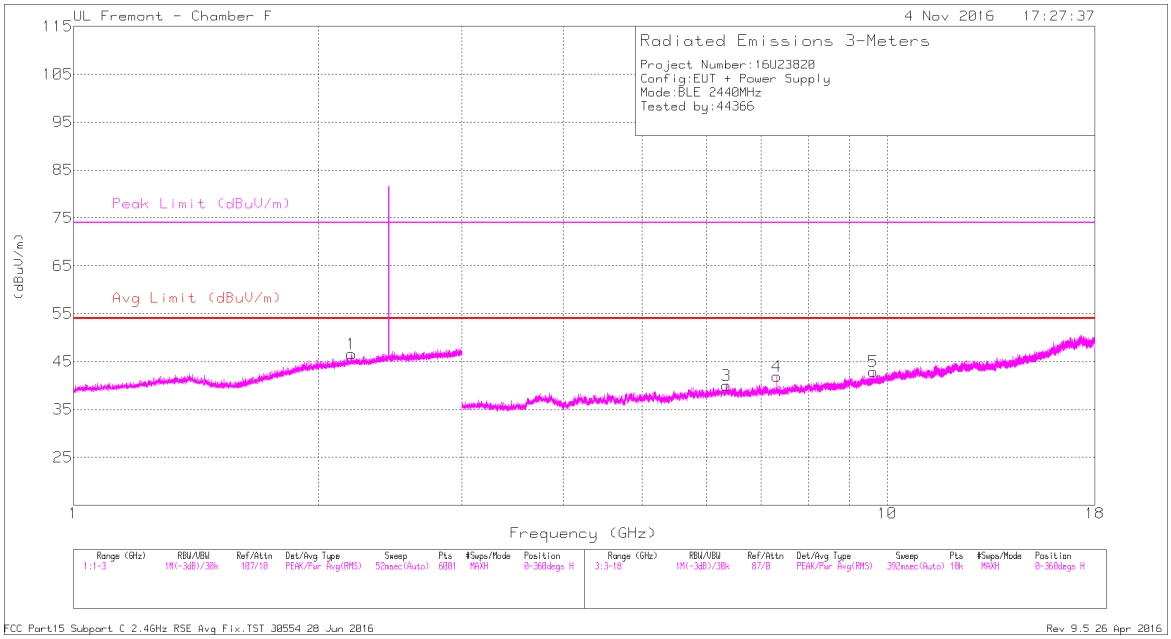
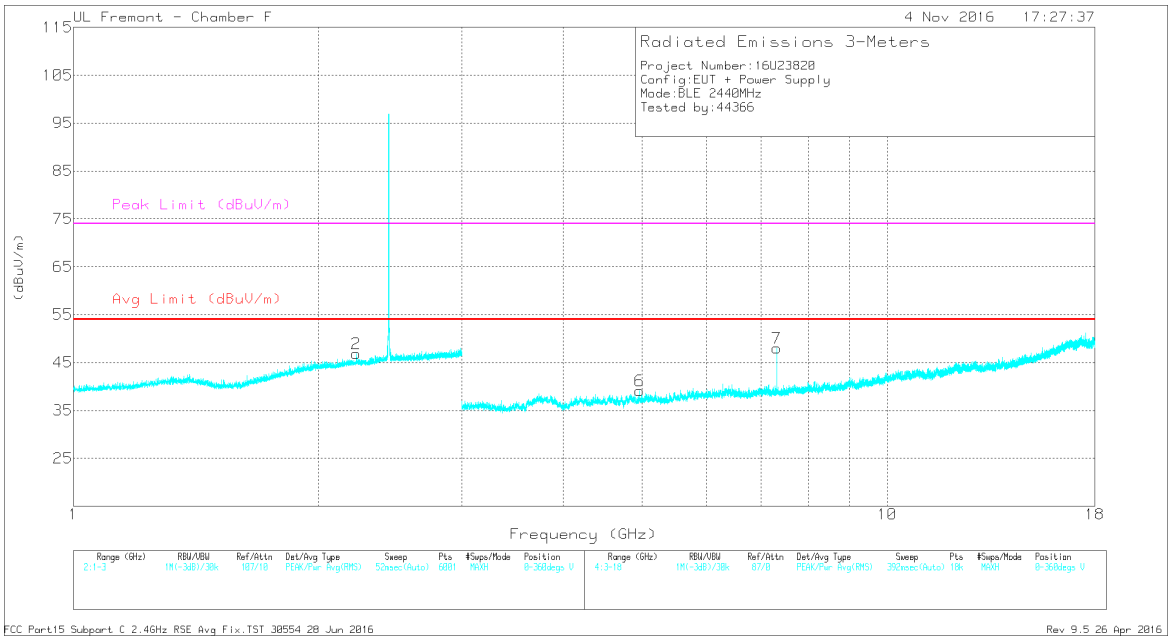
MID CHANNEL HORIZONTAL



MID 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	2.195	41.89	PK2	31.9	-21.1	0	52.69	-	-	-	-	344	252	H
2	* 2.226	42.74	PK2	31.8	-21	0	53.54	-	-	74	-20.46	117	304	V
	* 2.228	30.27	MAv1	31.8	-20.9	2.03	43.2	54	-10.8	-	-	117	304	V
3	6.346	37.2	PK2	35.4	-26.7	0	45.9	-	-	-	-	109	122	H
4	* 7.319	39.74	PK2	35.5	-26.5	0	48.74	-	-	74	-25.26	86	206	H
	* 7.319	29.31	MAv1	35.5	-26.5	2.03	40.34	54	-13.66	-	-	86	206	H
5	9.621	33.53	PK2	36.5	-22.2	0	47.83	-	-	-	-	62	360	H
6	* 4.964	37.84	PK2	34.2	-28.5	0	43.54	-	-	74	-30.46	350	141	V
	* 4.962	27.39	MAv1	34.2	-28.5	2.03	35.12	54	-18.88	-	-	350	141	V
7	* 7.319	42.7	PK2	35.5	-26.5	0	51.7	-	-	74	-22.3	270	184	V
	* 7.319	34.52	MAv1	35.5	-26.5	2.03	45.55	54	-8.45	-	-	270	184	V

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

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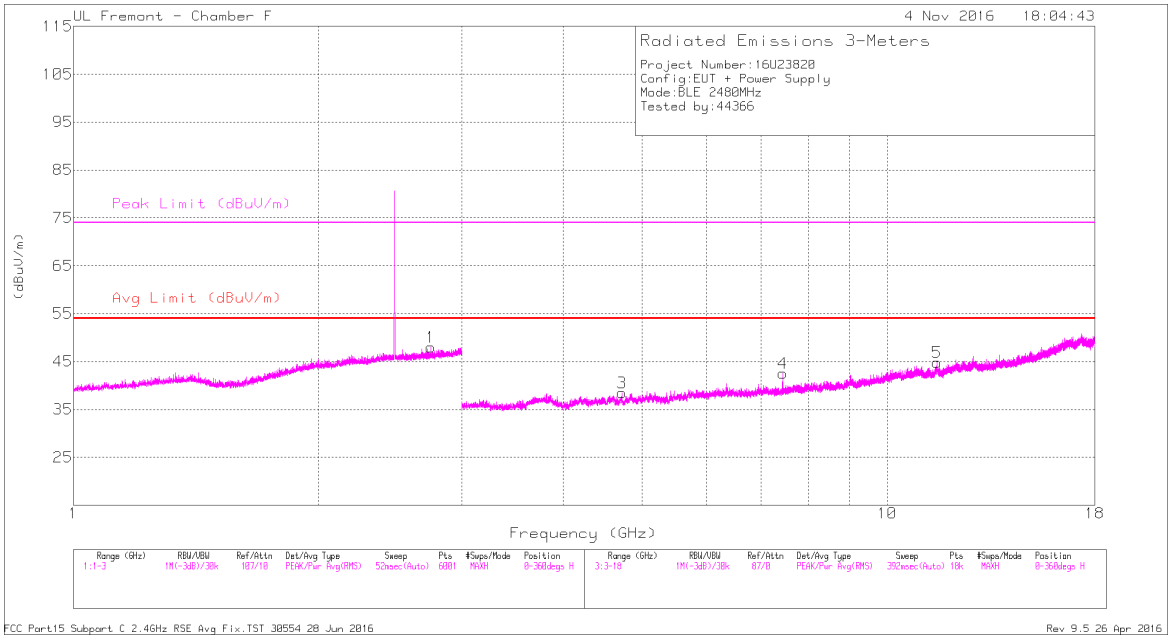
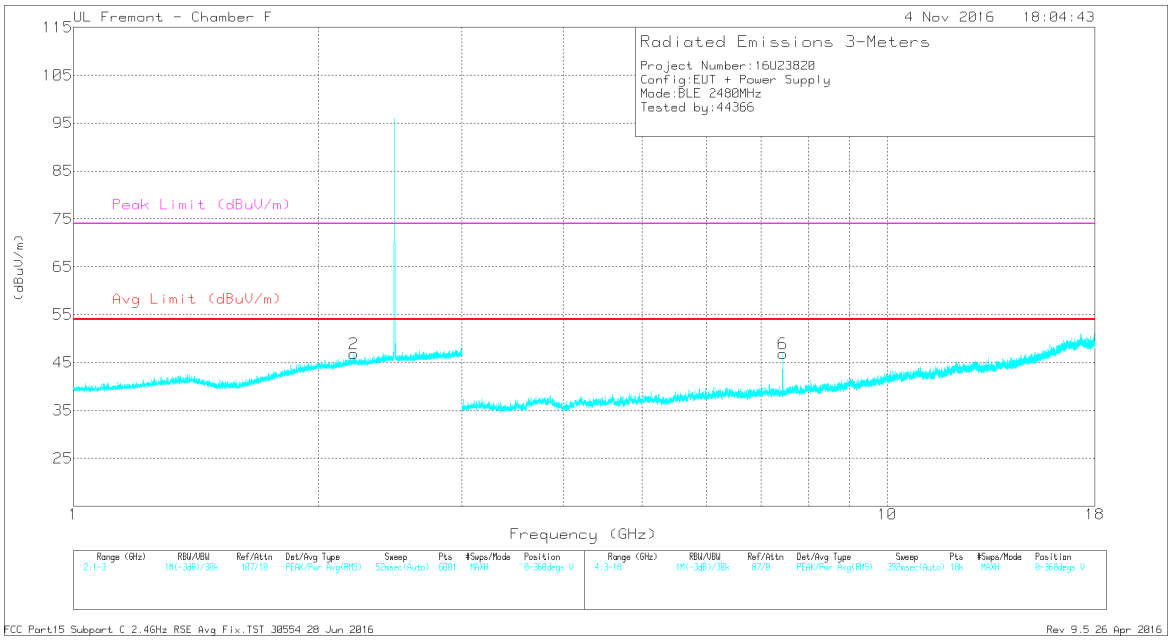
HIGH CHANNEL HORIZONTAL



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	* 2.749	41.36	PK2	32.5	-20.5	0	53.36	-	-	74	-20.64	318	369	H
	* 2.749	30.51	MAv1	32.5	-20.5	2.03	44.54	54	-9.46	-	-	318	369	H
2	* 2.213	41.08	PK2	31.9	-21	0	51.98	-	-	74	-22.02	182	327	V
	* 2.213	30.24	MAv1	31.9	-21	2.03	43.17	54	-10.83	-	-	182	327	V
3	* 4.721	38.2	PK2	34.1	-28.4	0	43.9	-	-	74	-30.1	196	129	H
	* 4.717	27.71	MAv1	34.1	-28.4	2.03	35.44	54	-18.56	-	-	196	129	H
4	* 7.44	38.07	PK2	35.6	-25.8	0	47.87	-	-	74	-26.13	156	124	H
	* 7.44	28.49	MAv1	35.6	-25.8	2.03	40.32	54	-13.68	-	-	156	124	H
5	* 11.521	33.75	PK2	38.1	-21	0	50.85	-	-	74	-23.15	356	309	H
	* 11.519	22.61	MAv1	38.1	-21	2.03	41.74	54	-12.26	-	-	356	309	H
6	* 7.441	41.69	PK2	35.6	-25.9	0	51.39	-	-	74	-22.61	266	173	V
	* 7.439	33.52	MAv1	35.6	-25.8	2.03	45.35	54	-8.65	-	-	266	173	V

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

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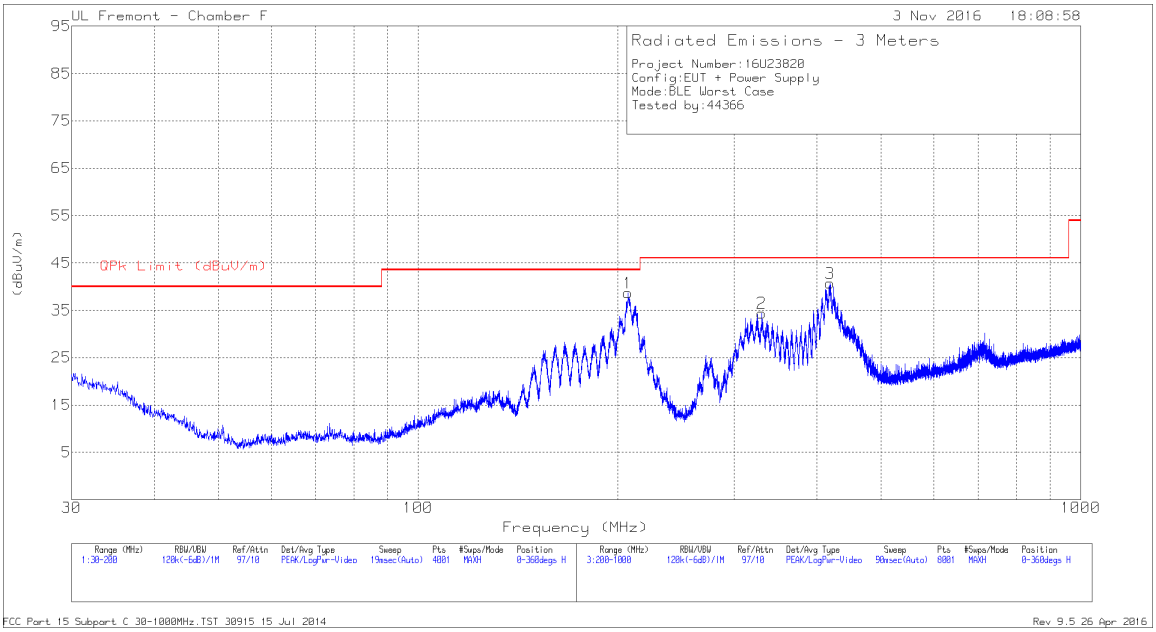
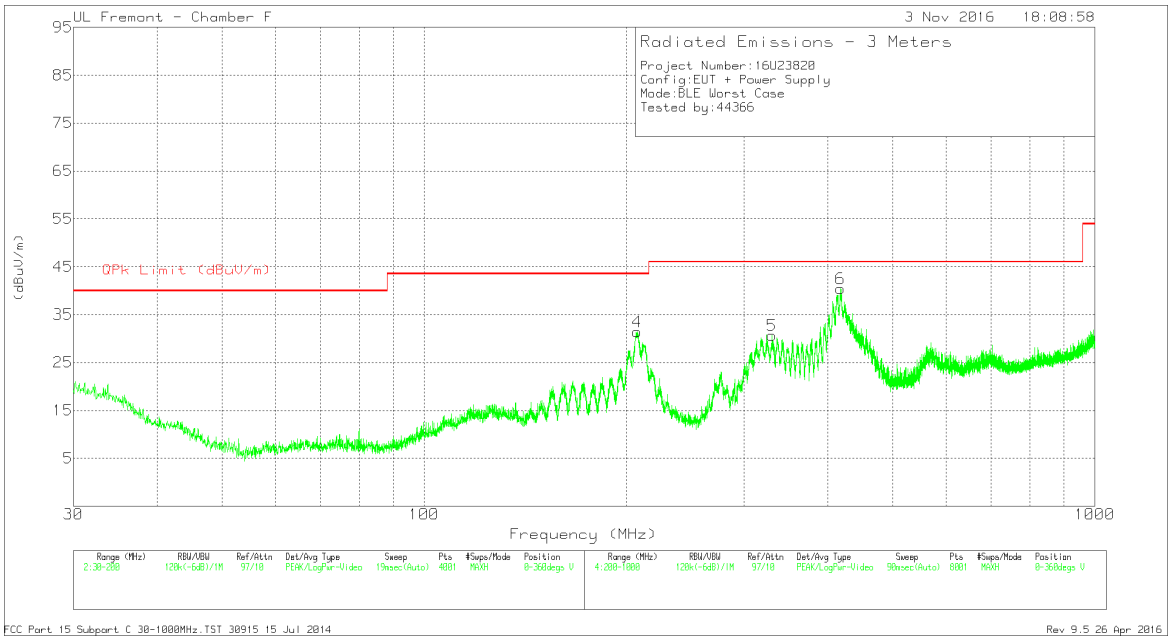
8.3. WORST-CASE BELOW 1 GHz

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	207.716	52.11	Qp	14.9	-30.4	36.61	43.52	-6.91	112	162	H
2	* 329.9	46.22	Pk	18	-29.8	34.42	46.02	-11.6	0-360	99	H
3	418.244	47.35	Qp	20.3	-29.3	38.35	46.02	-7.67	82	223	H
4	207.7	46.93	Pk	14.9	-30.4	31.43	43.52	-12.09	0-360	201	V
5	* 330.1	42.46	Pk	18	-29.8	30.66	46.02	-15.36	0-360	201	V
6	418.008	46.96	Qp	20.3	-29.3	37.96	46.02	-8.06	55	108	V

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

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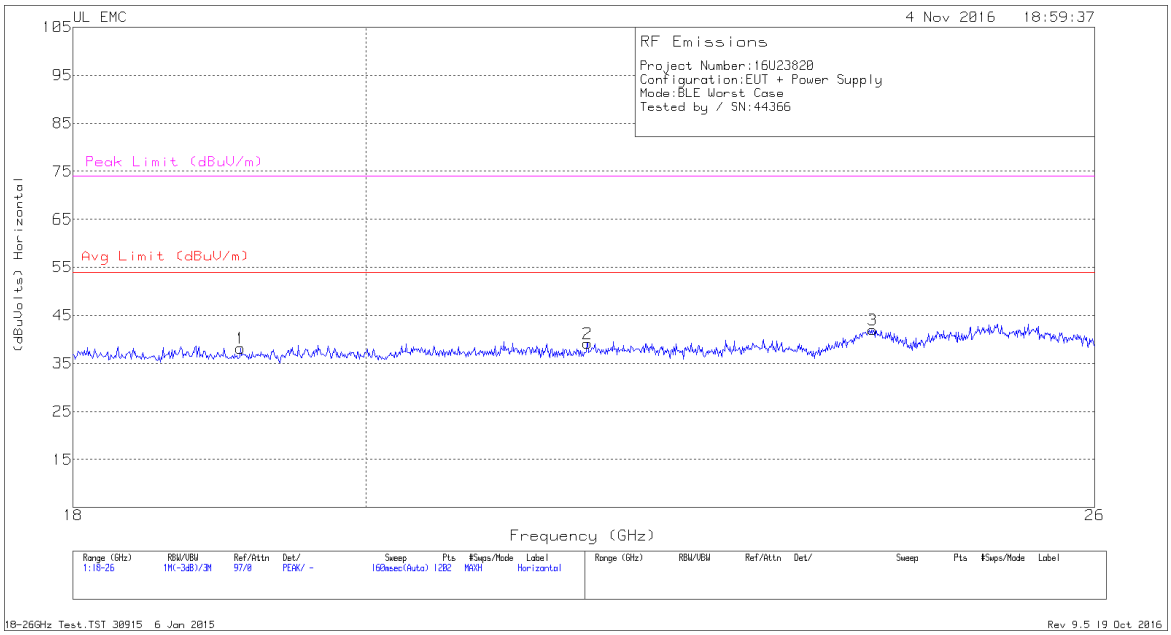
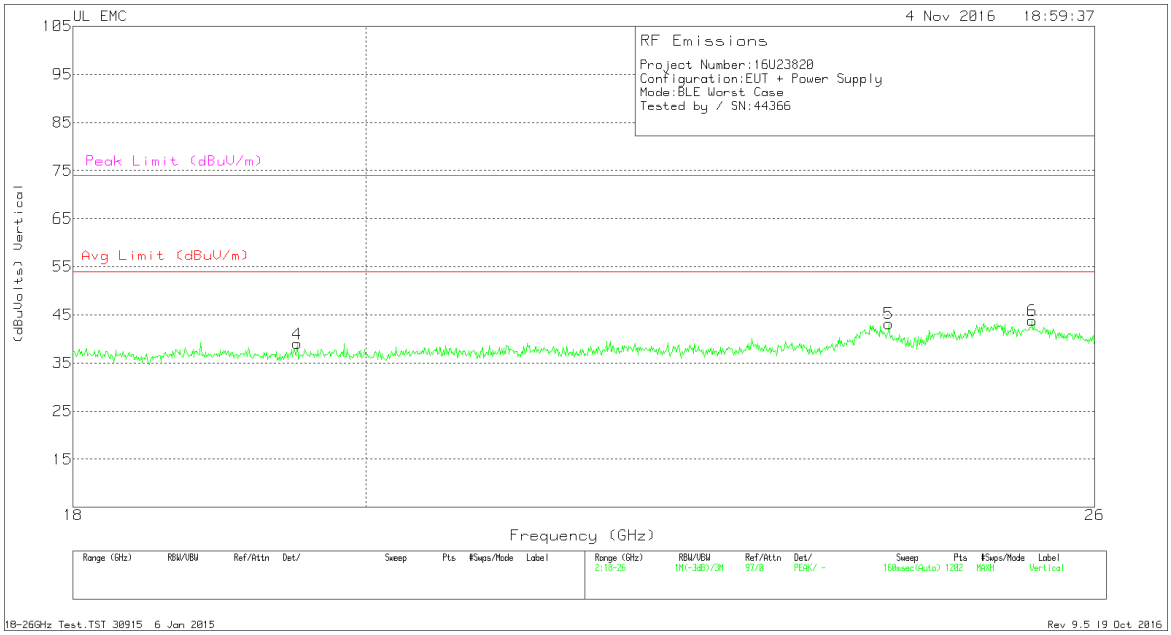
8.4. WORST-CASE 18 to 26 GHz

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	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	19.119	39.47	Pk	32.7	-24.5	-9.5	38.167	54	-15.833	74	-35.833
2	21.66	40.67	Pk	33.2	-25.2	-9.5	39.167	54	-14.833	74	-34.833
3	24.002	41.9	Pk	34	-24.4	-9.5	42	54	-12	74	-32
4	19.512	40.9	Pk	32.7	-25.1	-9.5	39	54	-15	74	-35
5	24.142	43.07	Pk	33.9	-24.3	-9.5	43.167	54	-10.833	74	-30.833
6	25.42	43.33	Pk	34.3	-24.3	-9.5	43.833	54	-10.167	74	-30.167

Pk - Peak detector

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9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

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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DATA

Range 1: 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	7.314	-1.22	Qp	0	.1	10.2	9.08	60	-50.92	-	-
2	7.37475	-3.17	Ca	0	.1	10.2	7.13	-	-	50	-42.87
3	21.6645	3.78	Qp	0	.2	10.4	14.38	60	-45.62	-	-
4	21.66675	2.04	Ca	0	.2	10.4	12.64	-	-	50	-37.36
5	22.45875	2.35	Qp	.1	.2	10.4	13.05	60	-46.95	-	-
6	22.461	.79	Ca	.1	.2	10.4	11.49	-	-	50	-38.51
7	23.1315	6.01	Qp	.1	.2	10.4	16.71	60	-43.29	-	-
8	23.1315	4.75	Ca	.1	.2	10.4	15.45	-	-	50	-34.55
9	23.919	5.49	Qp	.1	.2	10.4	16.19	60	-43.81	-	-
10	23.919	4.85	Ca	.1	.2	10.4	15.55	-	-	50	-34.45
11	27.16125	2.39	Qp	.1	.3	10.5	13.29	60	-46.71	-	-
12	27.1635	.29	Ca	.1	.3	10.5	11.19	-	-	50	-38.81

Range 2: 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	7.37475	-1.46	Qp	0	.1	10.2	8.84	60	-51.16	-	-
14	7.37475	-3.4	Ca	0	.1	10.2	6.9	-	-	50	-43.1
15	21.66675	1.57	Qp	0	.2	10.4	12.17	60	-47.83	-	-
16	21.66675	-.27	Ca	0	.2	10.4	10.33	-	-	50	-39.67
17	22.45875	.96	Qp	0	.2	10.4	11.56	60	-48.44	-	-
18	22.45988	-.77	Ca	0	.2	10.4	9.83	-	-	50	-40.17
19	23.1315	3	Qp	.1	.2	10.4	13.7	60	-46.3	-	-
20	23.1315	1.24	Ca	.1	.2	10.4	11.94	-	-	50	-38.06
21	23.919	4.22	Qp	.1	.2	10.4	14.92	60	-45.08	-	-
22	23.919	3.3	Ca	.1	.2	10.4	14	-	-	50	-36
23	27.16125	.59	Qp	.1	.3	10.5	11.49	60	-48.51	-	-
24	27.1635	-1.53	Ca	.1	.3	10.5	9.37	-	-	50	-40.63

Qp - Quasi-Peak detector

Ca - CISPR average detection

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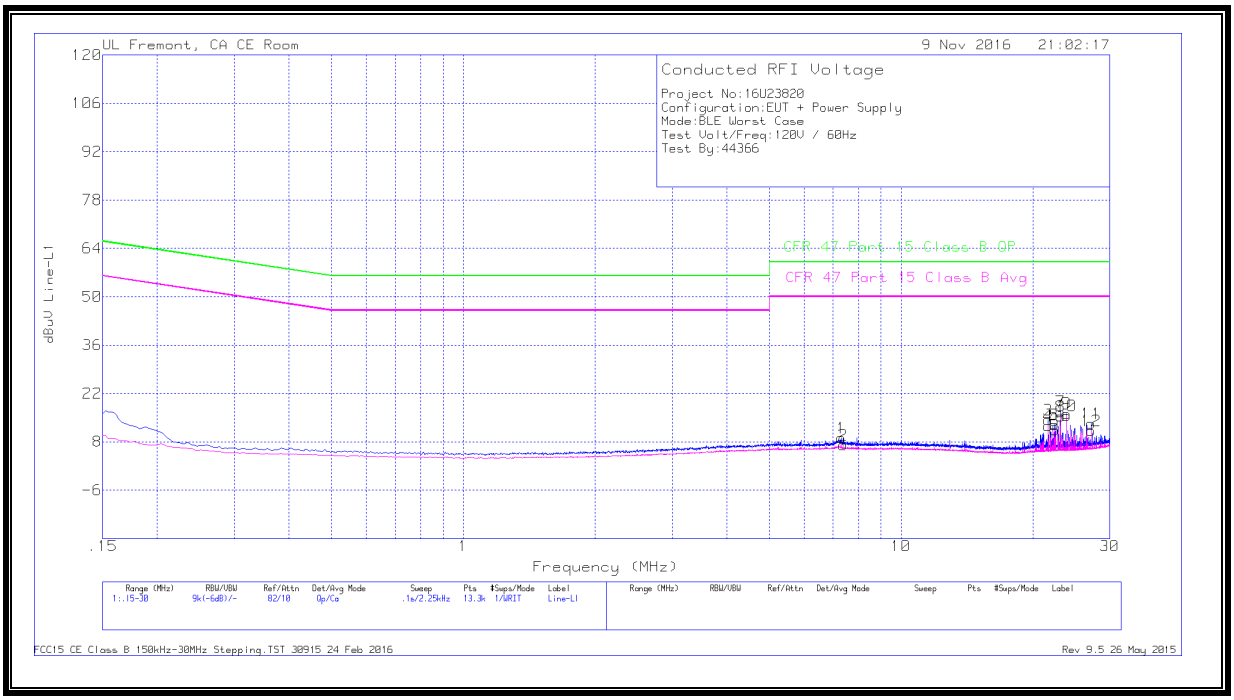
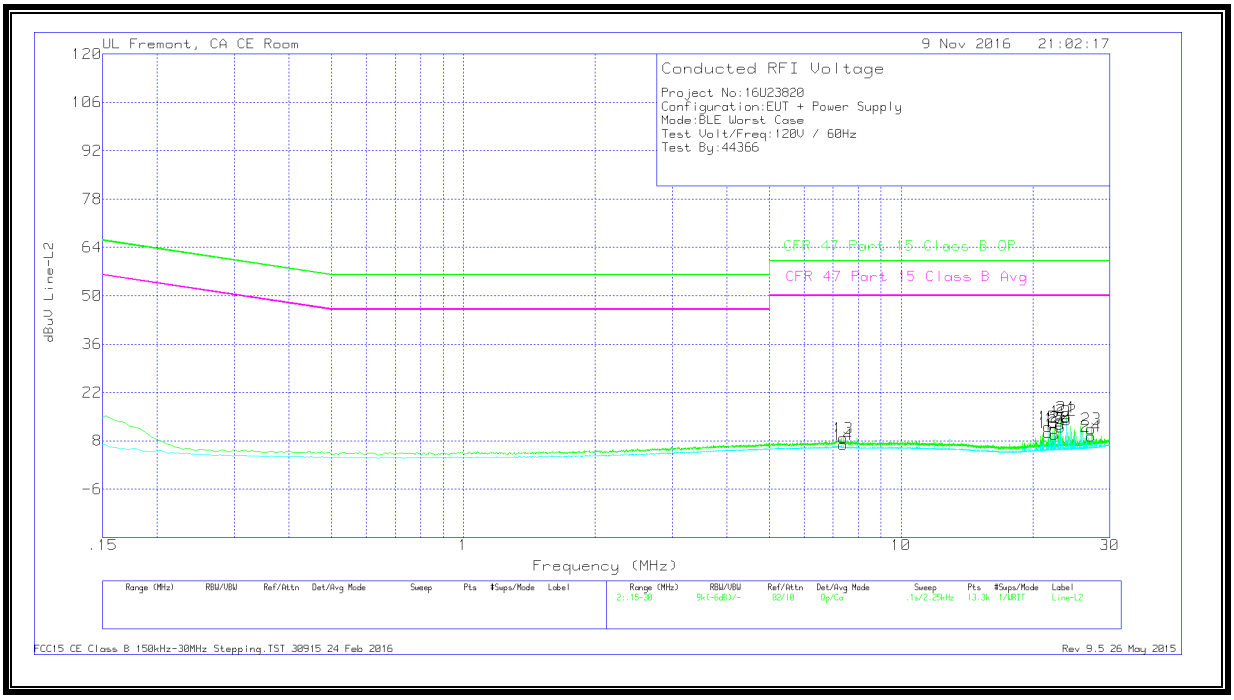
LINE 1 RESULTS



LINE 2 RESULTS



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