



**FCC 47 CFR PART 15 SUBPART C**

**BLUETOOTH LOW ENERGY  
CERTIFICATION TEST REPORT**

**FOR**

**WIRELESS DEVICE**

**MODEL NUMBER: A1844**

**FCC ID: BCGA1844**

**REPORT NUMBER: 16U23799-E1V4**

**ISSUE DATE: SEPTEMBER 16, 2016**

*Prepared for*

**APPLE, INC.**

**1 INFINITE LOOP**

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**NVLAP LAB CODE 200065-0**

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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	09/08/2016	Initial Issue	Chin Pang
V2	09/12/2016	Address TCB's Questions	Chin Pang
V3	09/12/2016	Address Reviewer Comments	Mengistu Mekuria
V4	09/16/2016	Address TCB Comments	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:** A1844

**SERIAL NUMBER:** 001 (Conducted), 002 (Radiated)

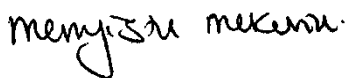
**DATE TESTED:** AUGUST 18, 2016 – SEPTEMBER 02, 2016

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.

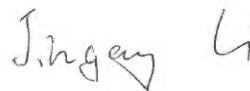
**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. 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.

Approved & Released For  
UL Verification Services Inc. By:



MENGISTU MEKURIA  
SENIOR ENGINEER  
UL VERIFICATION SERVICES INC.

Prepared By:



JINGANG LI  
EMC ENGINEER  
UL VERIFICATION SERVICES INC.

## 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
<input type="checkbox"/> Chamber A	<input type="checkbox"/> Chamber D
<input type="checkbox"/> Chamber B	<input type="checkbox"/> Chamber E
<input type="checkbox"/> Chamber C	<input checked="" type="checkbox"/> Chamber F
	<input type="checkbox"/> Chamber G
	<input type="checkbox"/> 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>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

### 4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
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%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is wireless device with Bluetooth 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	3.72	2.36

### 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). The Z (Portrait) orientation was determined to be the worst-case orientation. Therefore, all final radiated testing was performed with the EUT in Z (Portrait) orientation.

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

BLE: 1 Mbps.



## 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)

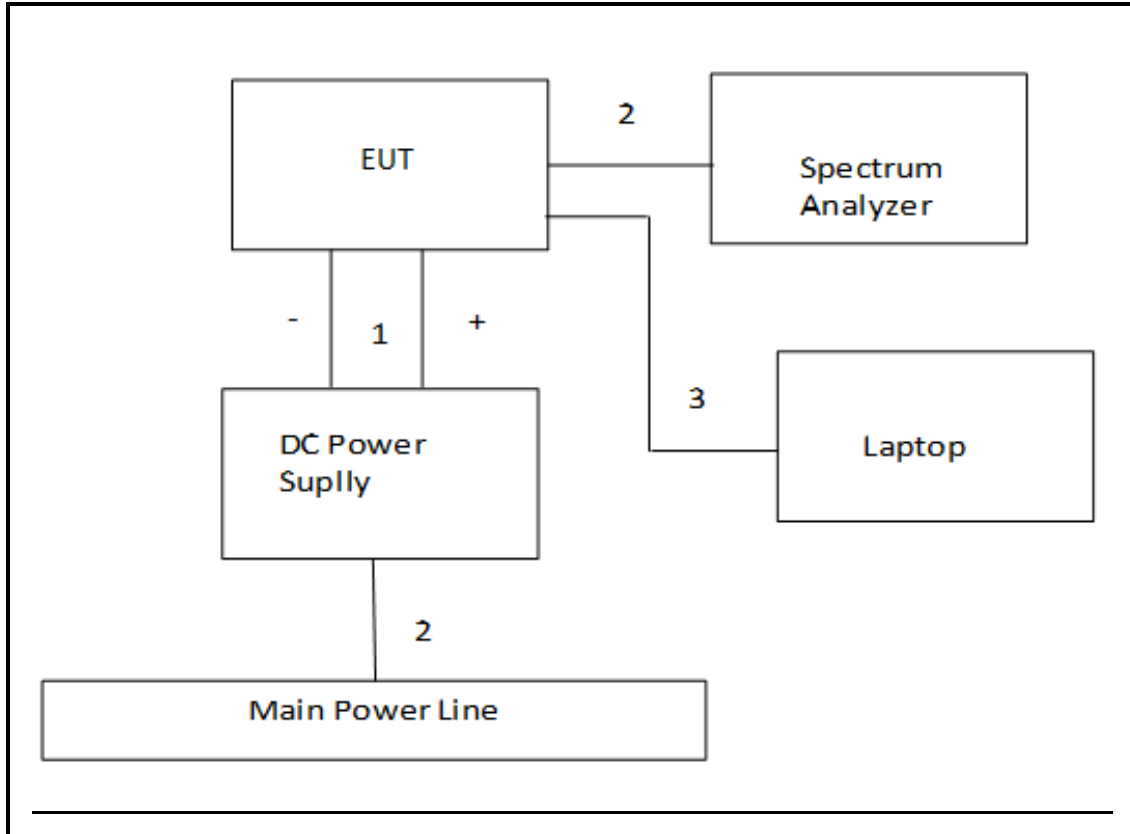
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC	1	4 pins connector	Un-Shielded	1	N/A

### I/O CABLES (AC LINE CONDUCTED: AC/DC ADAPTER & LAPTOP CONFIGURATION)

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

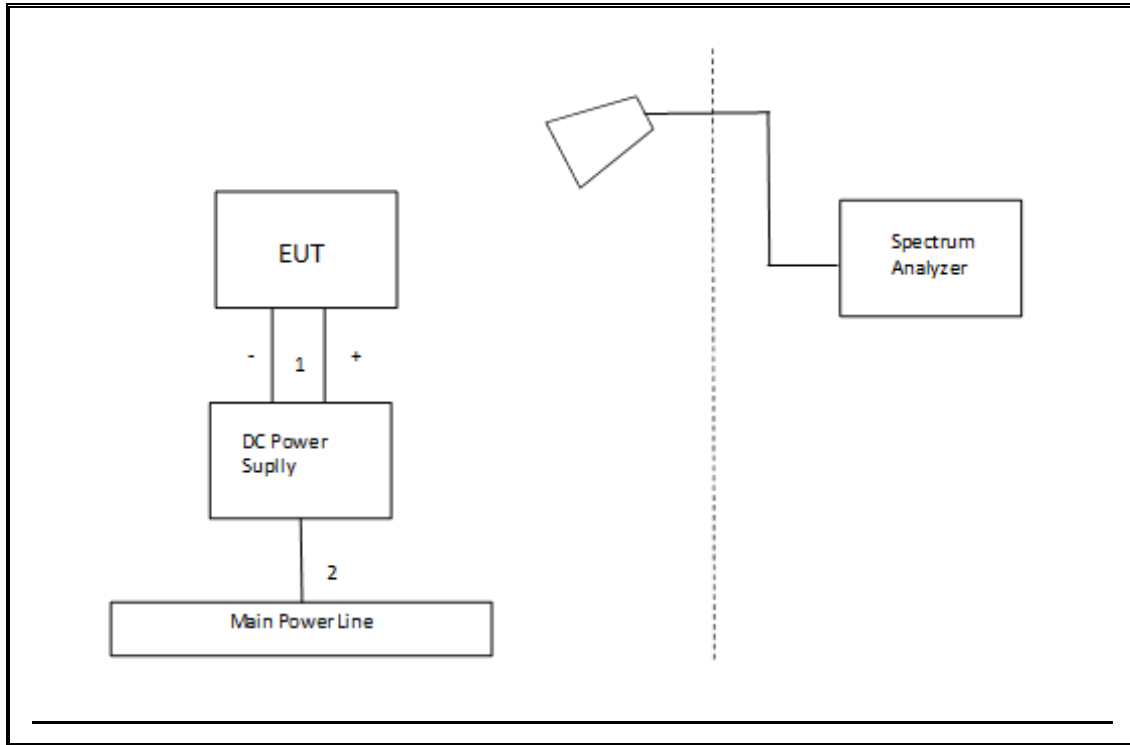
**TEST SETUP- CONDUCTED PORT**

**SETUP DIAGRAM**



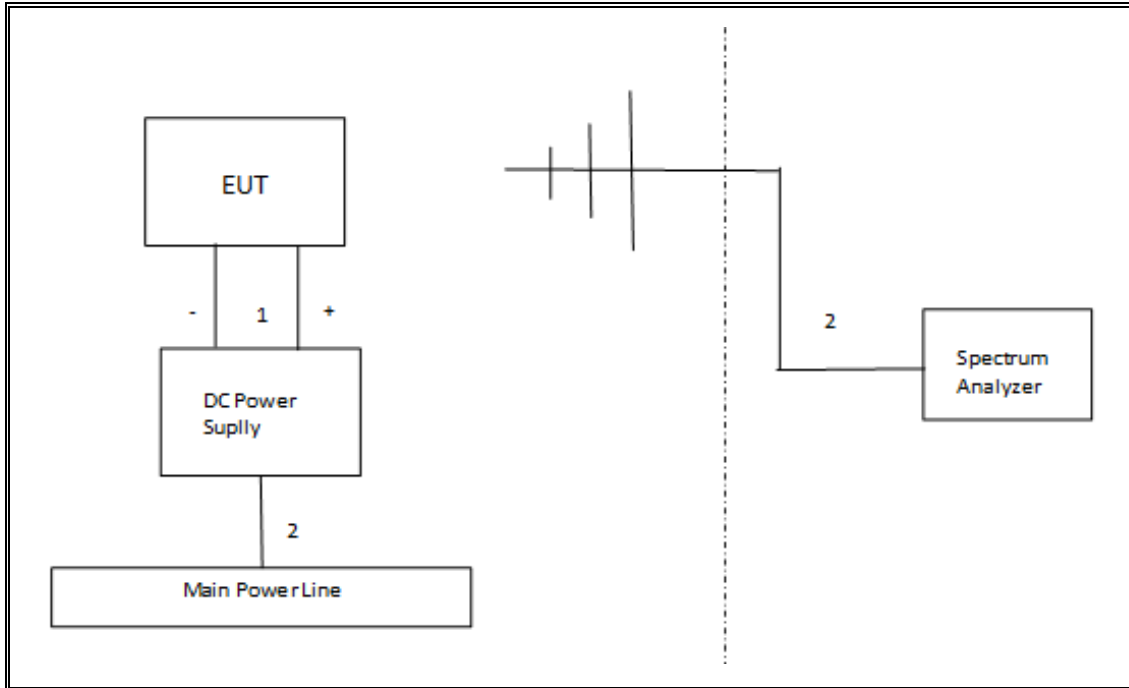
**TEST SETUP- RADIATED-ABOVE 1 GHZ**

**SETUP DIAGRAM**

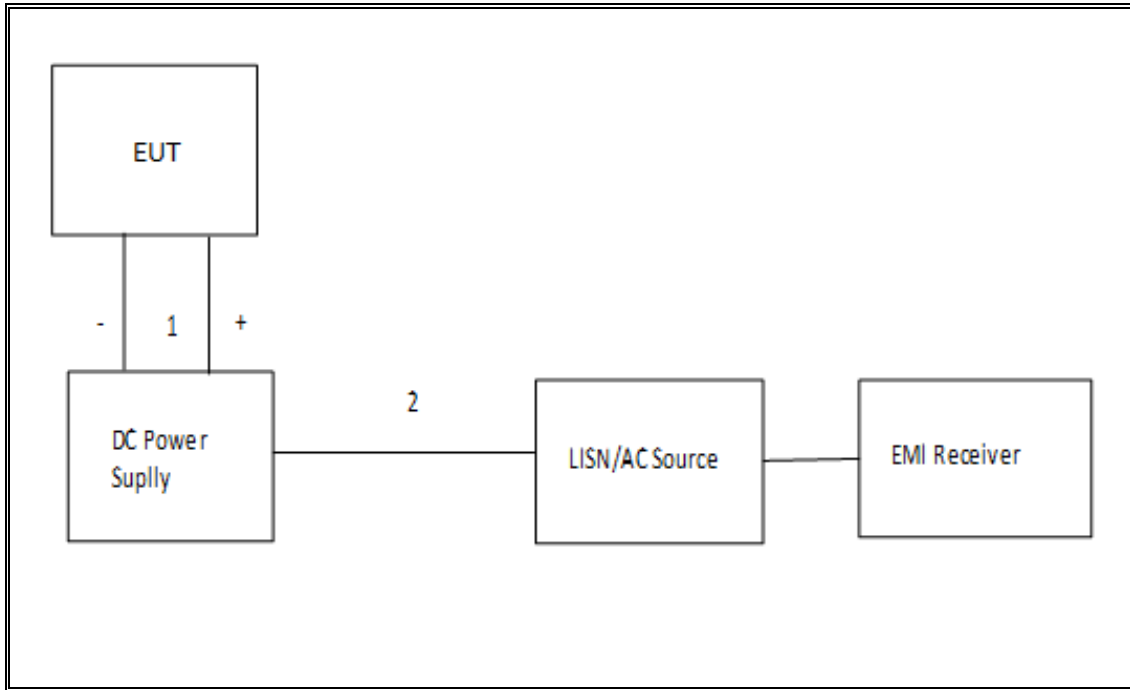


**TEST SETUP- BELOW 1GHz**

**SETUP DIAGRAM**



**AC LINE SETUP DIAGRAM**



## 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	4/5/2017
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	1/14/2015	1/29/2017
Amplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	1/25/2016	1/25/2017
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	6/17/2016	6/17/2017
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	10/14/2015	10/14/2016
Power Meter, P-series single channel	Keysight	N1911A	3/17/2016	3/17/2017
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight	N1921A	9/23/2015	9/23/2016
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826	6/6/2016	6/6/2017
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Keysight	8449B	7/5/2016	7/5/2016
AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ECSI7	09/09/15	09/09/16
LISN for Conducted Emissions CISPR-16	FCC	50/250-25-2	01/16/15	06/08/17
Power Cable, Line Conducted Emissions ANSI 63.4	UL	PG1	7/28/2015	9/30/2016
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

## 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.





### 7.3. 6 dB BANDWIDTH

#### LIMITS

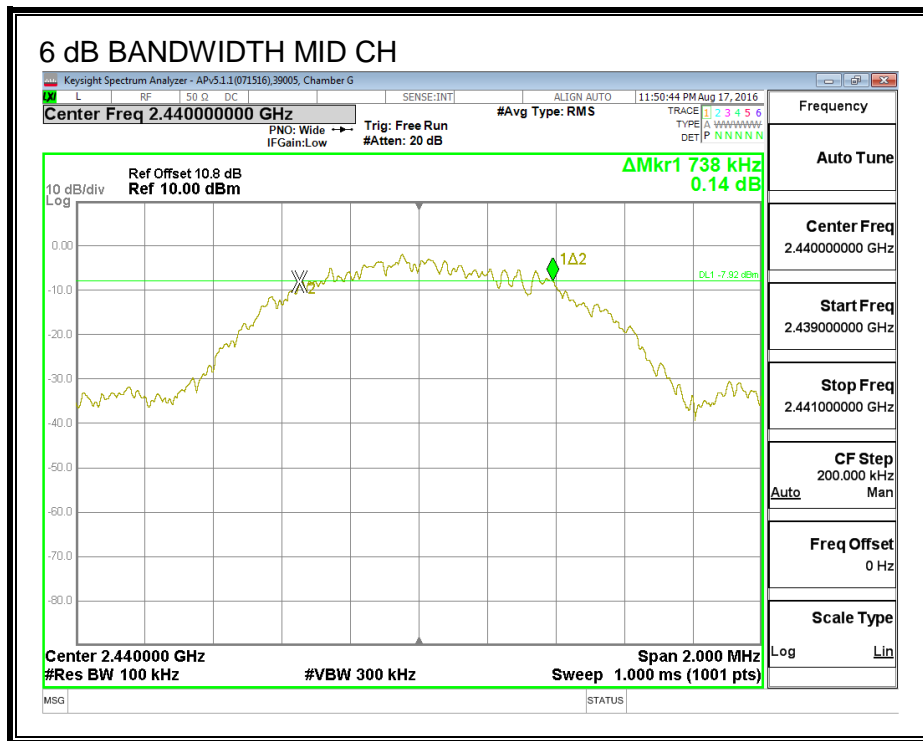
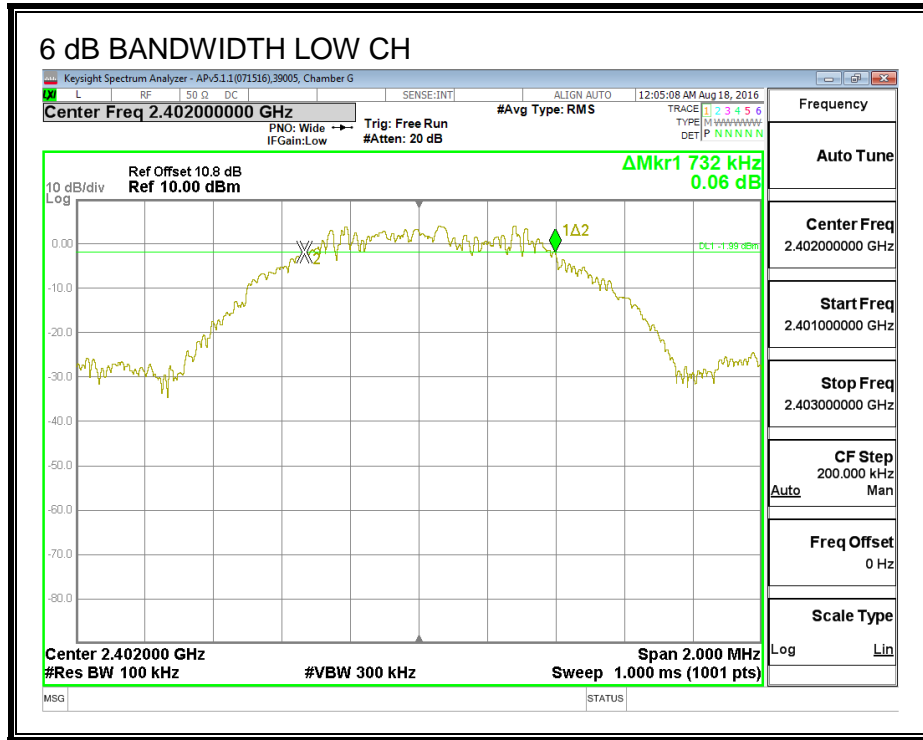
FCC §15.247 (a) (2)

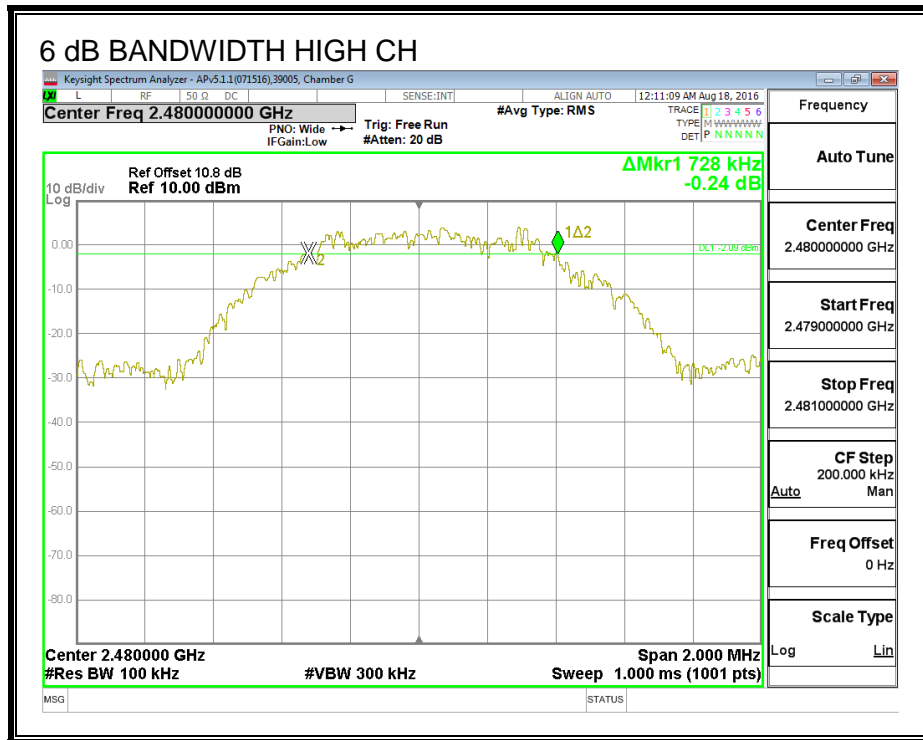
The minimum 6 dB bandwidth shall be at least 500 kHz.

#### RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.732	0.5
Middle	2440	0.738	0.5
High	2480	0.728	0.5

**6 dB BANDWIDTH**





## 7.4. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

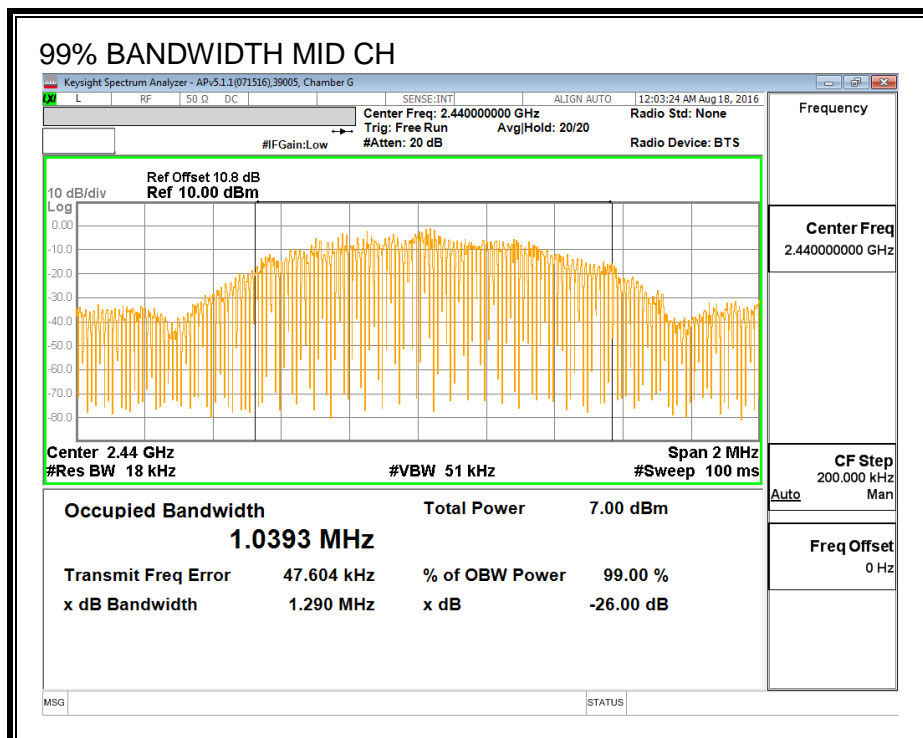
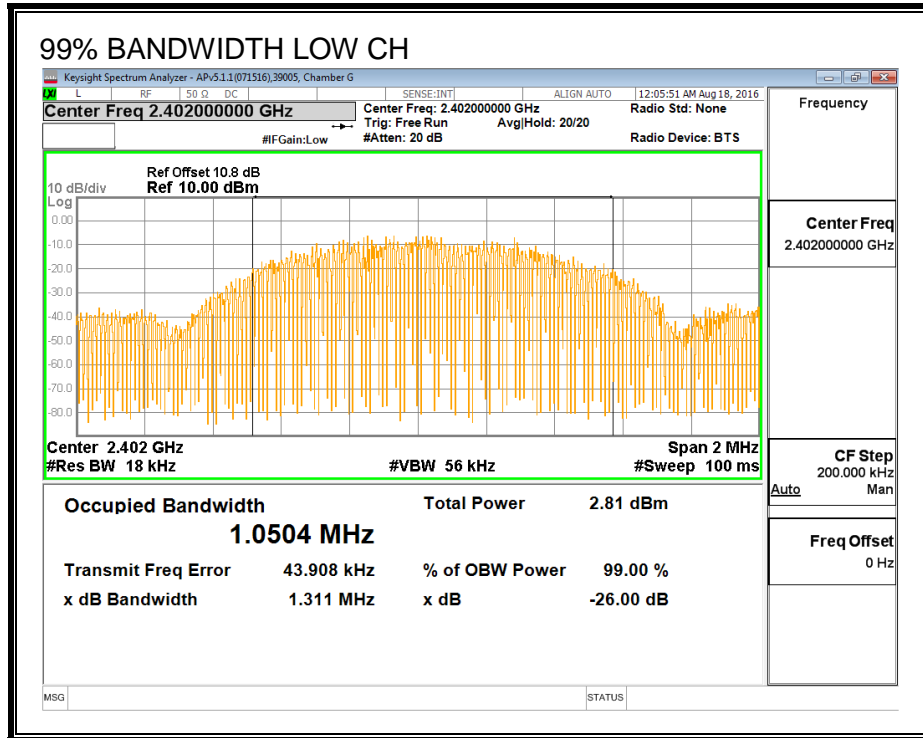
### TEST PROCEDURE

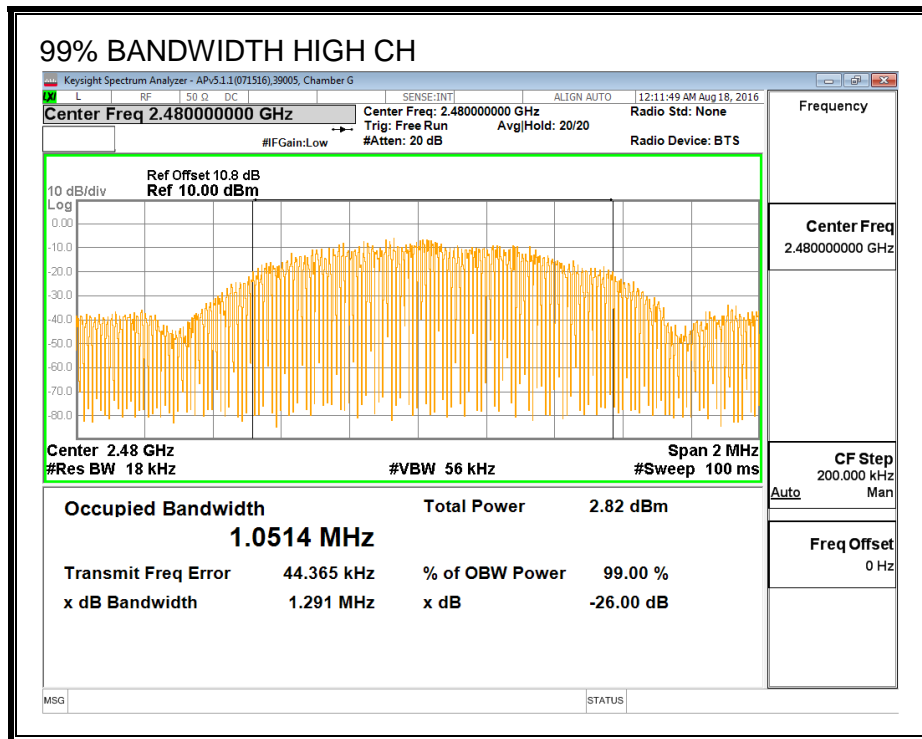
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0504
Middle	2440	1.0393
High	2480	1.0514

**99% BANDWIDTH**





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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.

<b>ID:</b>	39005	<b>Date:</b>	8/17/16
------------	-------	--------------	---------

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>AV power (dBm)</b>
Low	2402	3.46
Middle	2440	3.60
High	2480	3.49

## 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

<b>ID:</b>	39005	<b>Date:</b>	8/17/16
------------	-------	--------------	---------

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Peak Power Reading (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
Low	2402	3.58	30	-26.420
Middle	2440	3.72	30	-26.280
High	2480	3.61	30	-26.390



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## 7.7. POWER SPECTRAL DENSITY

### LIMITS

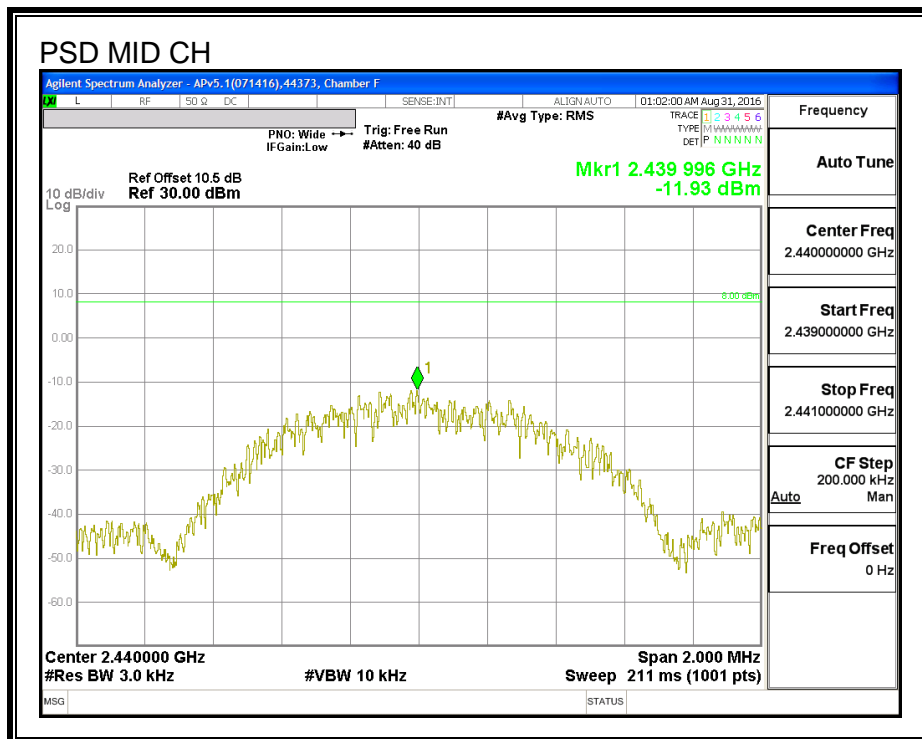
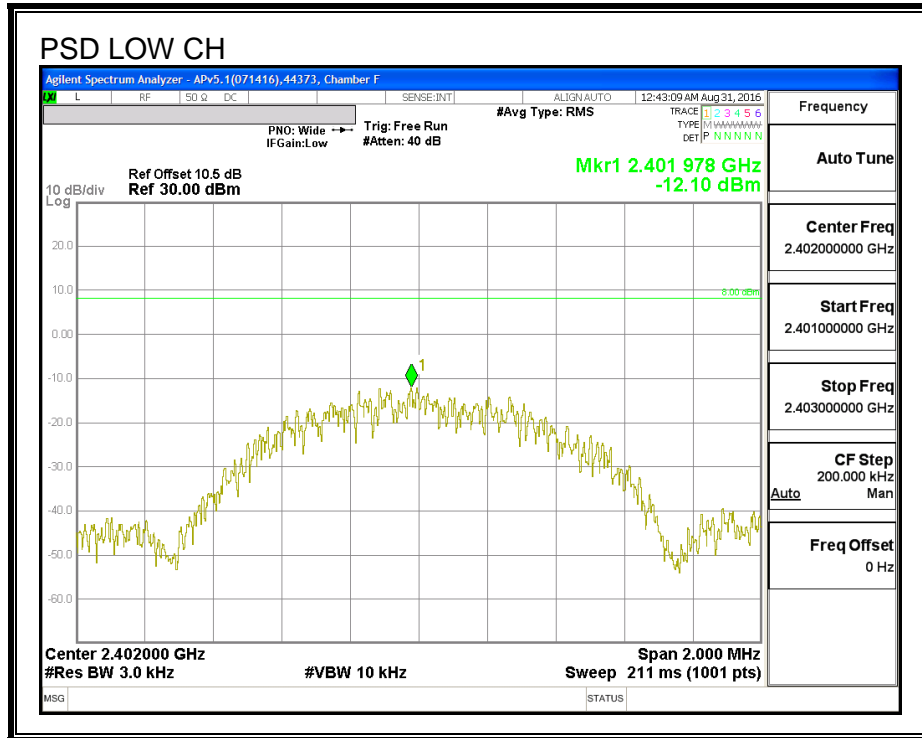
FCC §15.247 (e)

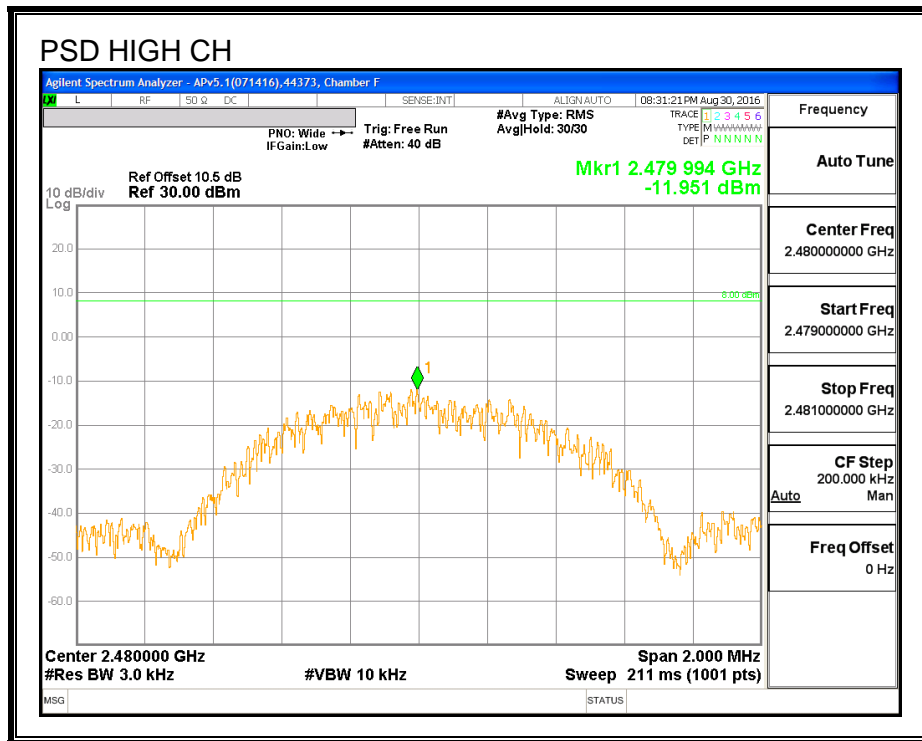
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### RESULTS

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-12.100	8	-20.10
Middle	2440	-11.930	8	-19.93
High	2480	-11.951	8	-19.95

**POWER SPECTRAL DENSITY**





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## **7.8. CONDUCTED SPURIOUS EMISSIONS**

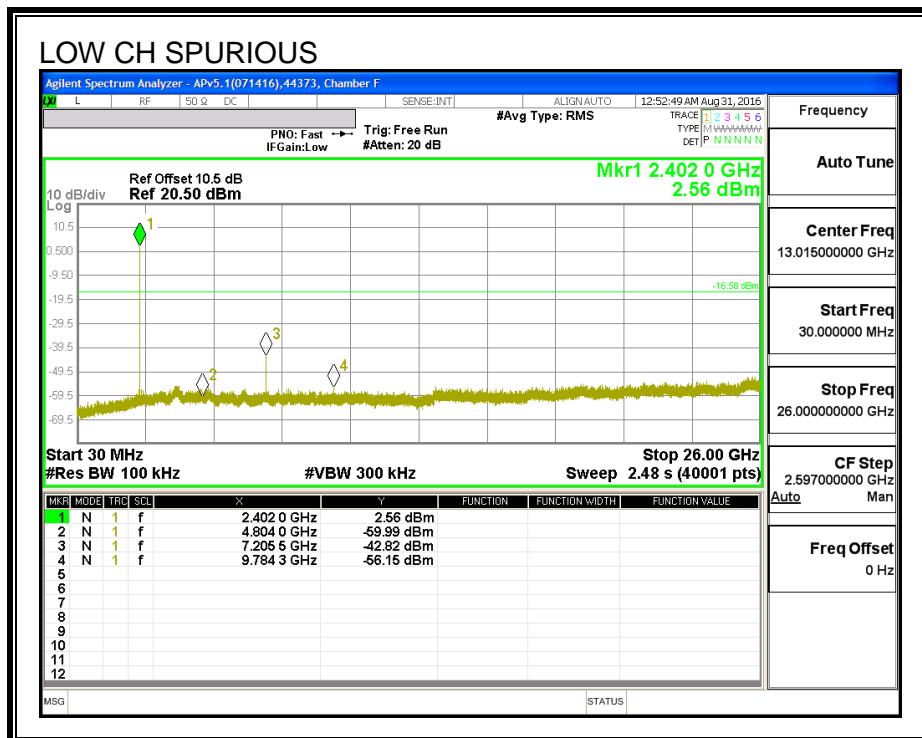
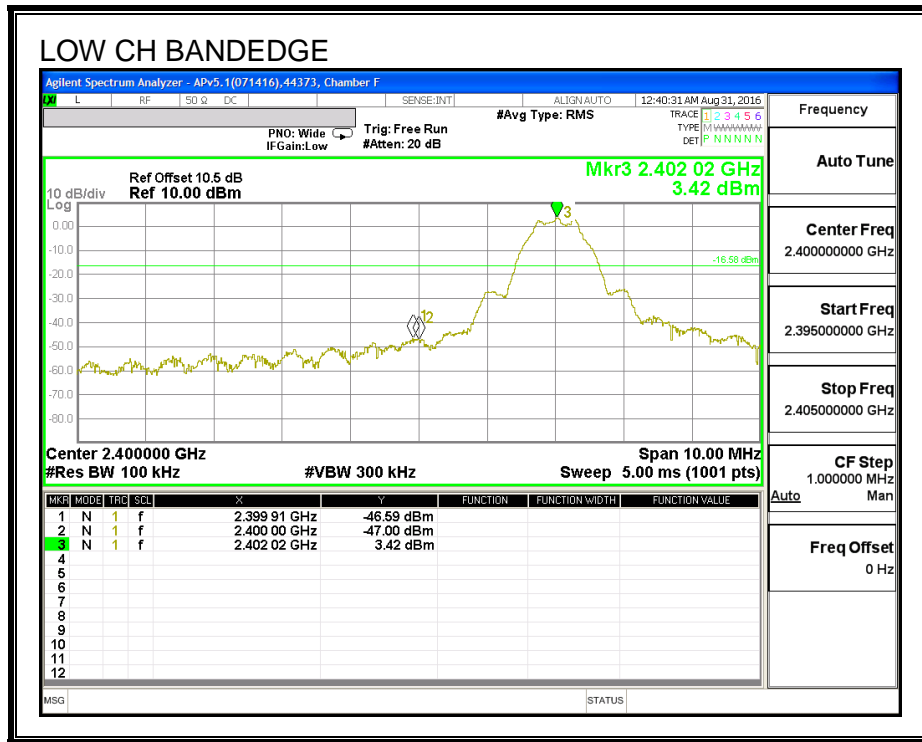
### **LIMITS**

FCC §15.247 (d)

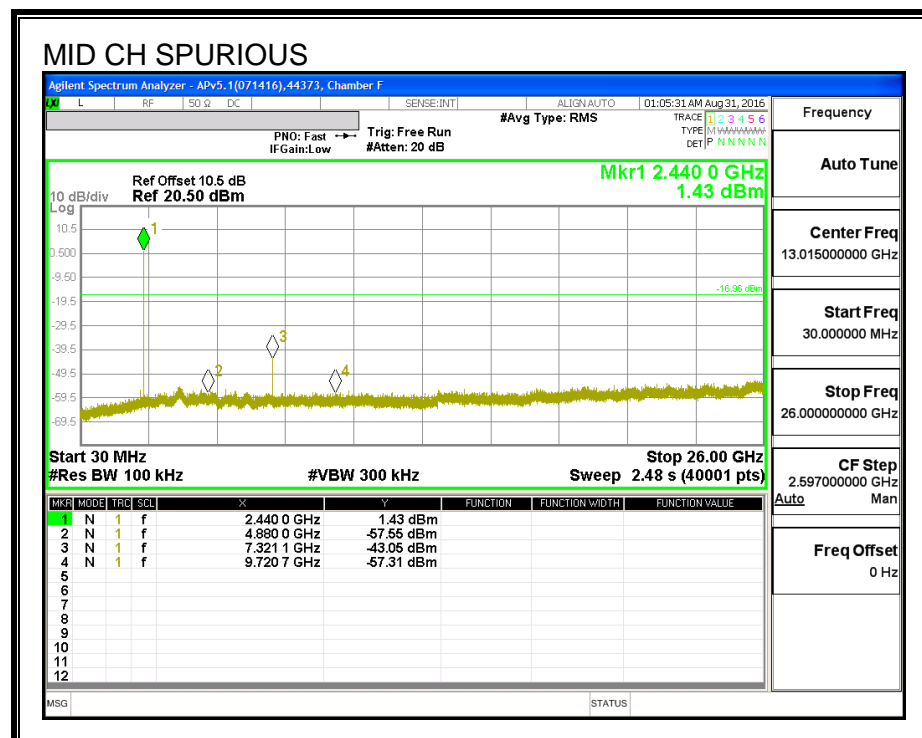
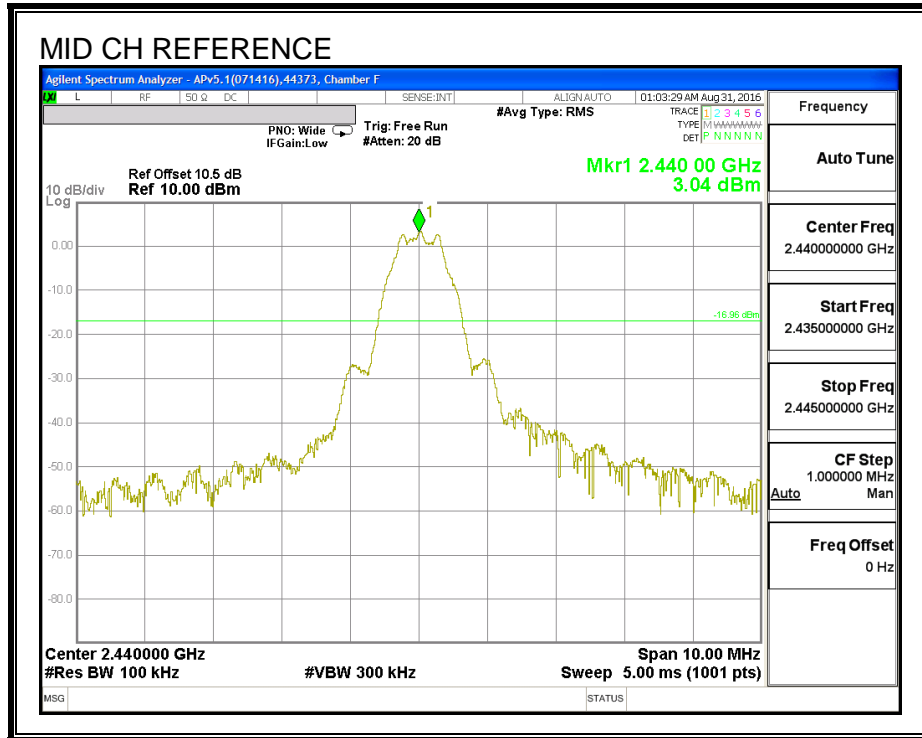
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

### **RESULTS**

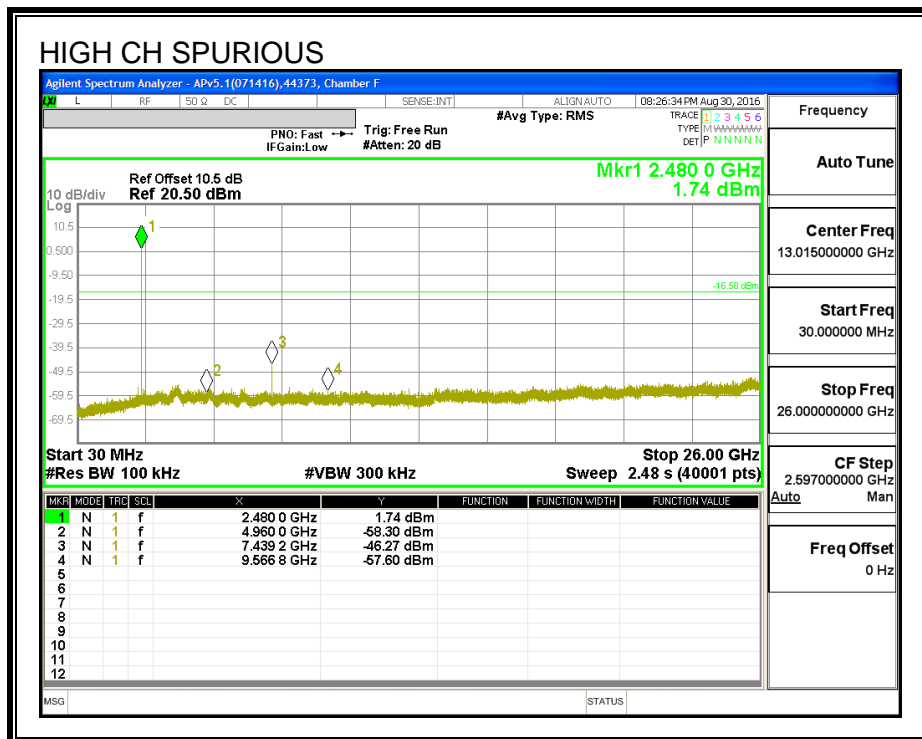
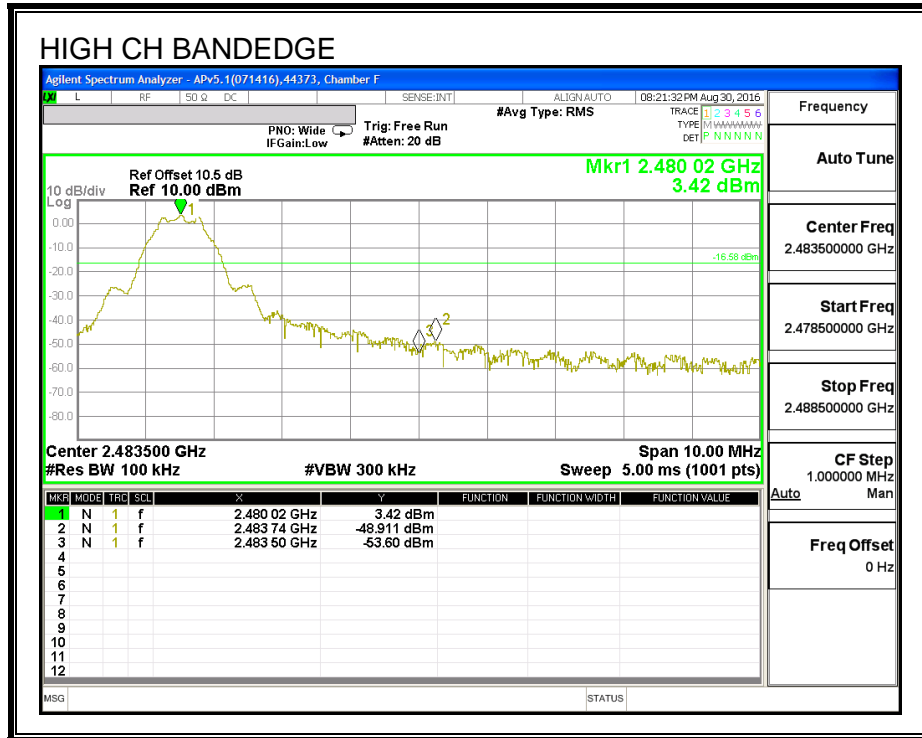
**SPURIOUS EMISSIONS, LOW CHANNEL**



**SPURIOUS EMISSIONS, MID CHANNEL**



**SPURIOUS EMISSIONS, HIGH CHANNEL**



## 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.

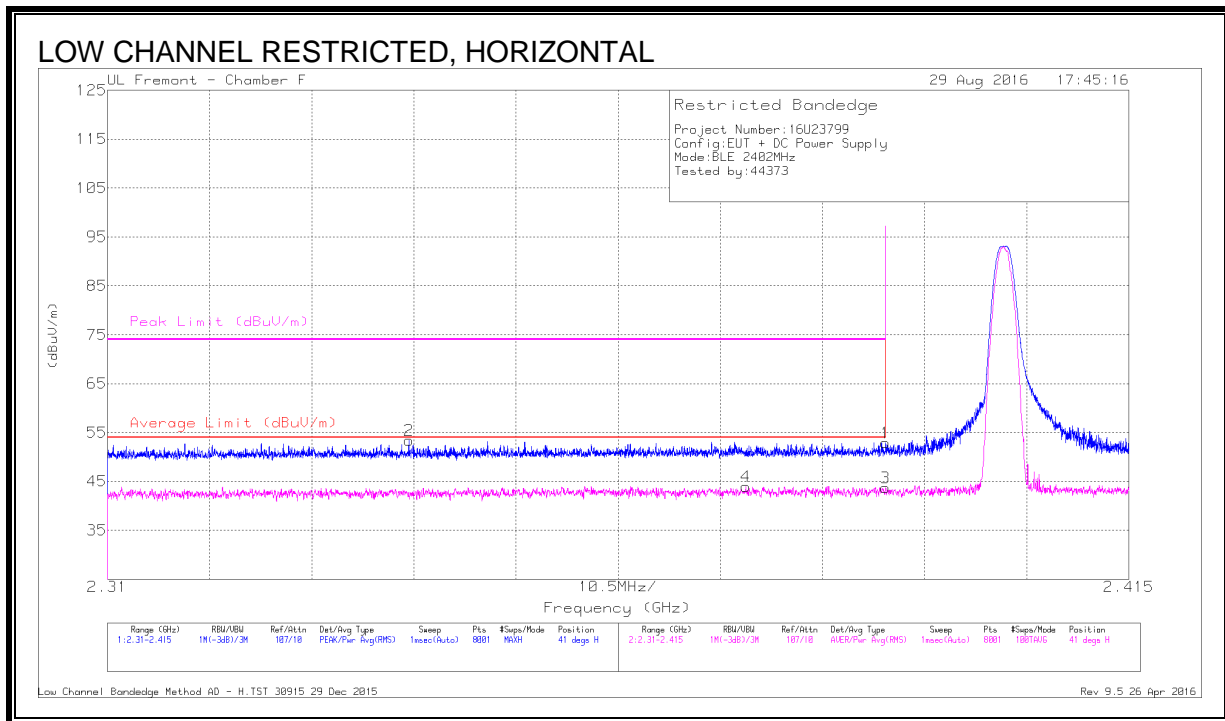
For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

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.



## 8.2. TRANSMITTER ABOVE 1 GHz



### 8.2.1. RESTRICTED BANDEGE

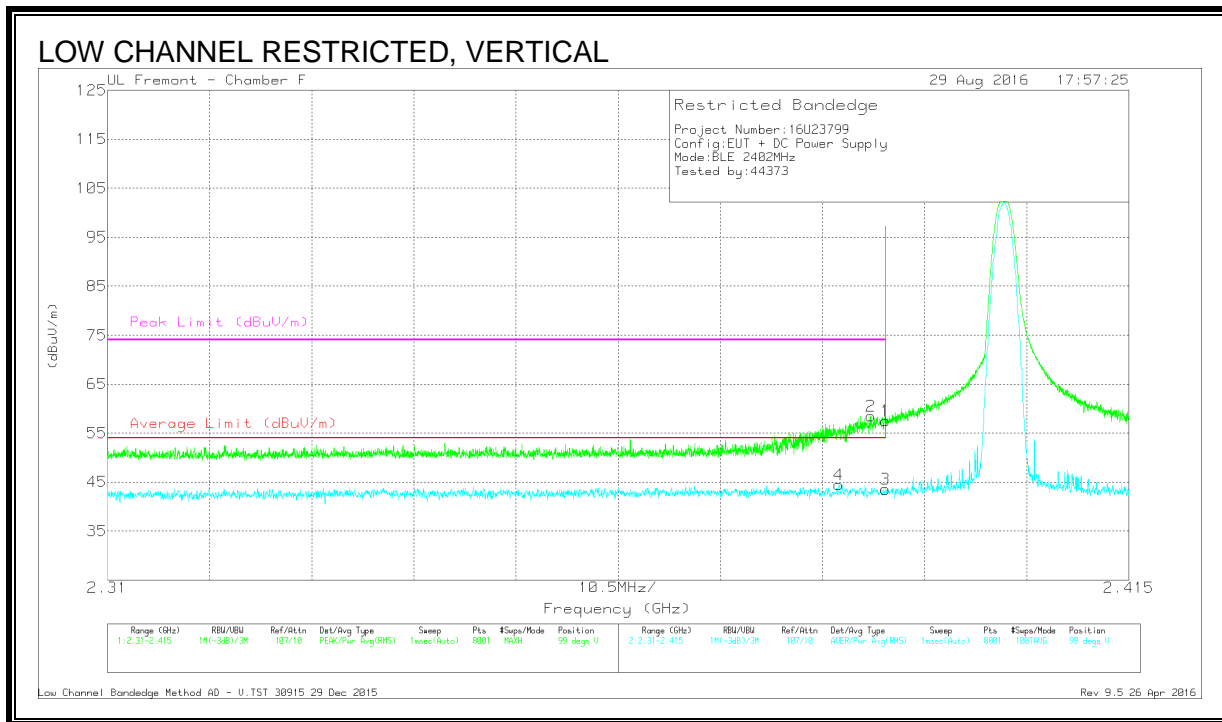
#### DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degrees)	Height (cm)	Polarity
1	* 2.39	41.67	Pk	32.1	-20.9	0	52.87	-	-	74	-21.13	41	130	H
2	* 2.341	42.4	Pk	31.9	-20.9	0	53.4	-	-	74	-20.6	41	130	H
3	* 2.39	30.43	RMS	32.1	-20.9	2.01	43.64	54	-10.36	-	-	41	130	H
4	* 2.376	30.75	RMS	32.1	-20.9	2.01	43.96	54	-10.04	-	-	41	130	H

\* - indicates frequency in CFR47 Pt 15 / Restricted Band

Pk - Peak detector

RMS - RMS detection



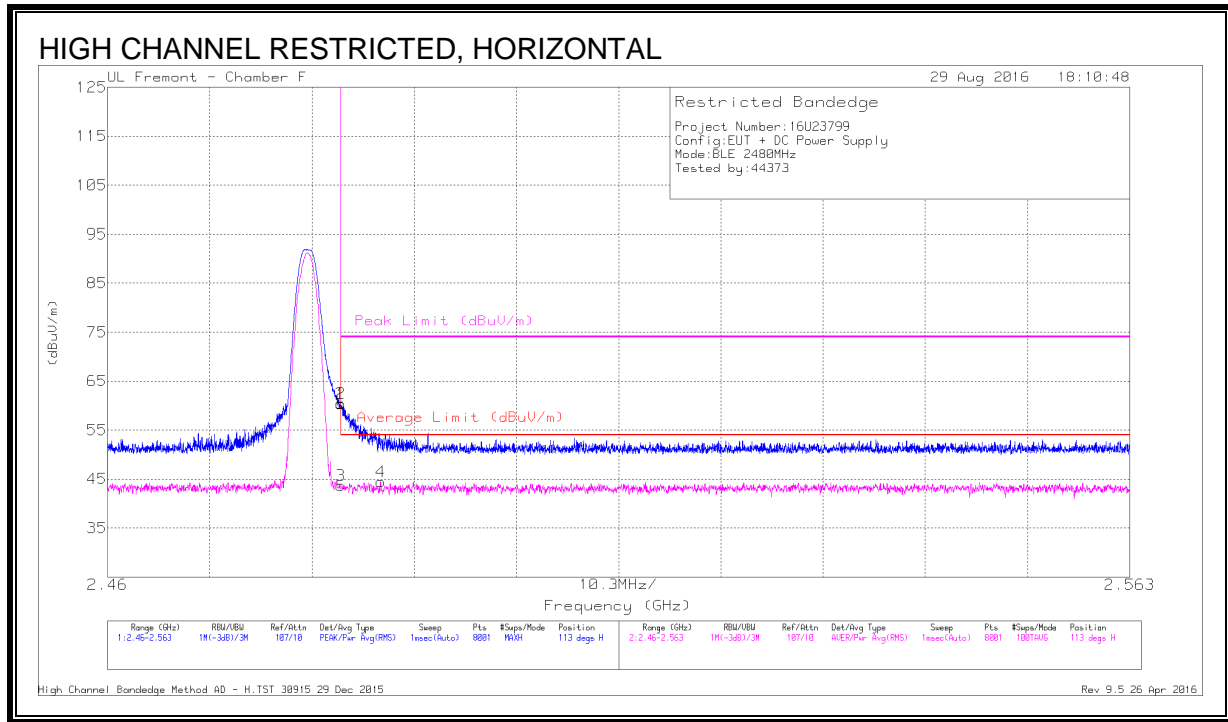
**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pa d (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degrees)	Height (cm)	Polarity
1	* 2.39	46.35	Pk	32.1	-20.9	0	57.55	-	-	74	-16.45	99	215	V
2	* 2.388	47.34	Pk	32.1	-20.9	0	58.54	-	-	74	-15.46	99	215	V
3	* 2.39	30.29	RMS	32.1	-20.9	2.01	43.50	54	-10.50	-	-	99	215	V
4	* 2.385	31.19	RMS	32.1	-20.9	2.01	44.40	54	-9.60	-	-	99	215	V

\* - indicates frequency in CFR47 Pt 15 Restricted Band

Pk - Peak detector

RMS - RMS detection



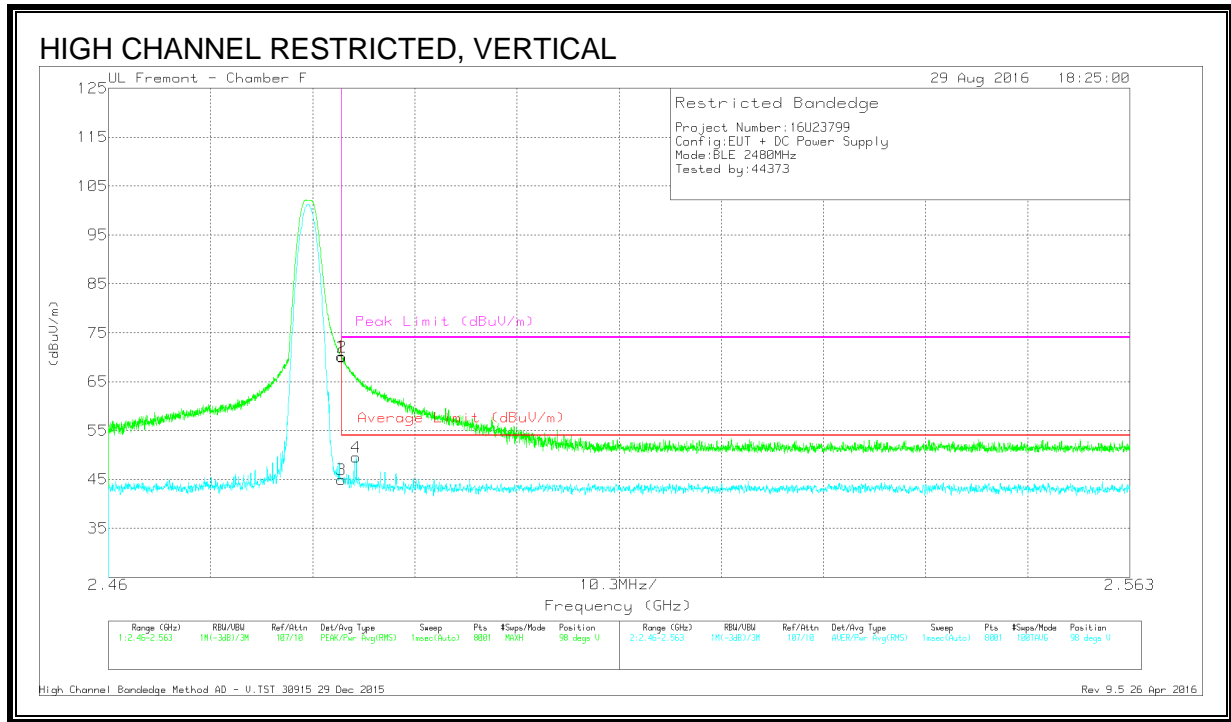
**DATA**

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
1	* 2.484	49.05	Pk	32.3	-21	0	60.35	-	-	74	-13.65	113	291	H
2	* 2.484	49.2	Pk	32.3	-21	0	60.5	-	-	74	-13.5	113	291	H
3	* 2.484	30.4	RMS	32.3	-21	2.01	43.71	54	-10.29	-	-	113	291	H
4	* 2.488	31.01	RMS	32.3	-20.9	2.01	44.42	54	-9.58	-	-	113	291	H

\* - indicates frequency in CFR47 Pt 15 Restricted Band

Pk - Peak detector

RMS - RMS detection

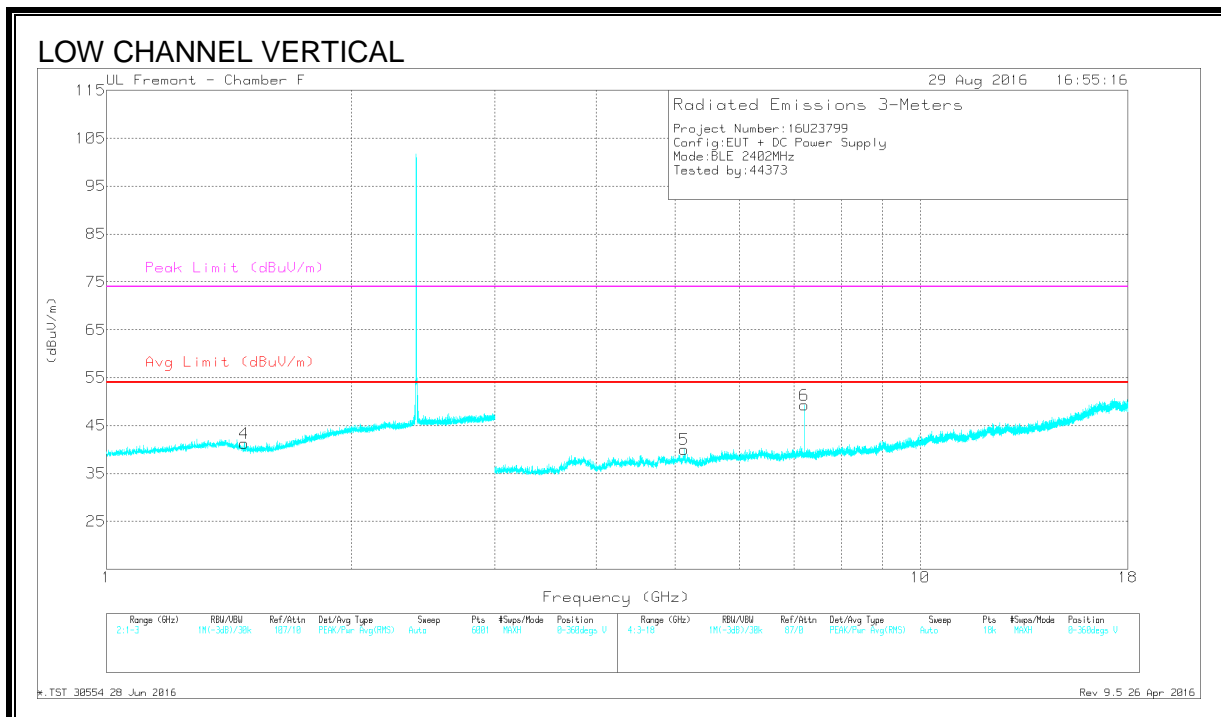
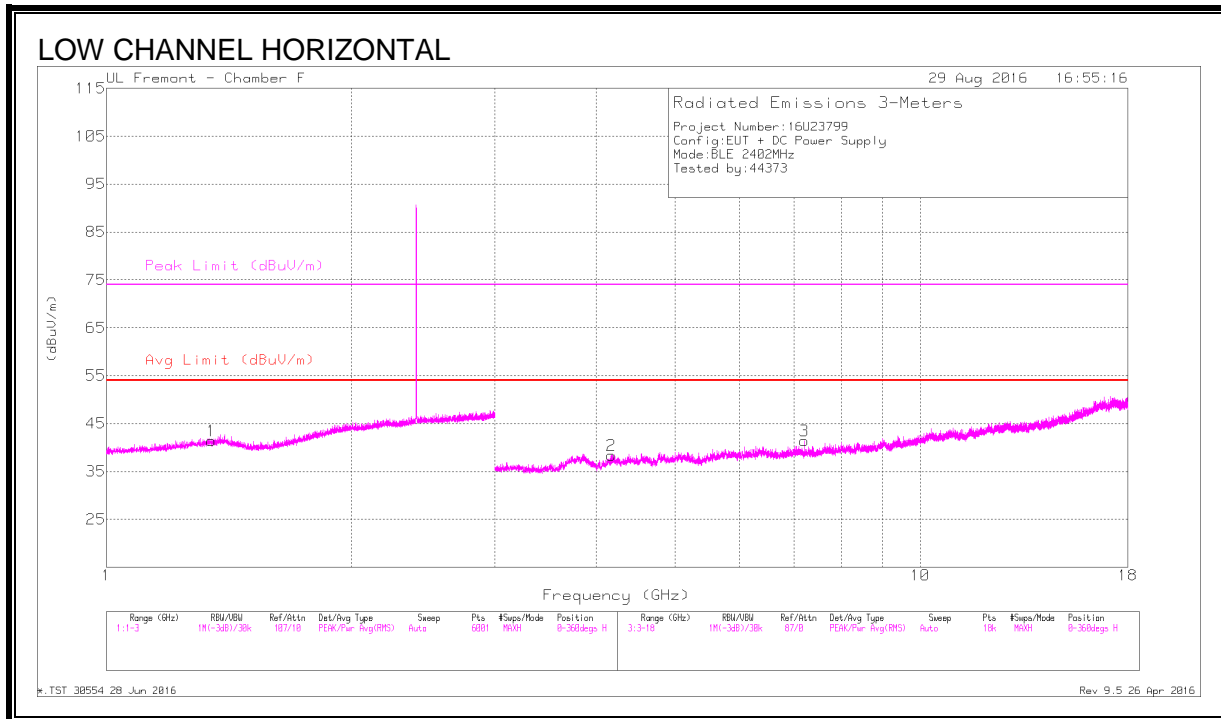


**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fit r/Pad (dB)	DC Cor (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	58.85	Pk	32.3	-21	0	70.15	-	-	74	-3.85	98	202	V
2	* 2.484	58.71	Pk	32.3	-21	0	70.01	-	-	74	-3.99	98	202	V
3	* 2.484	31.66	RMS	32.3	-21	2.01	44.97	54	-9.03	-	-	98	202	V
4	* 2.485	36.11	RMS	32.3	-20.9	2.01	49.52	54	-4.48	-	-	98	202	V

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

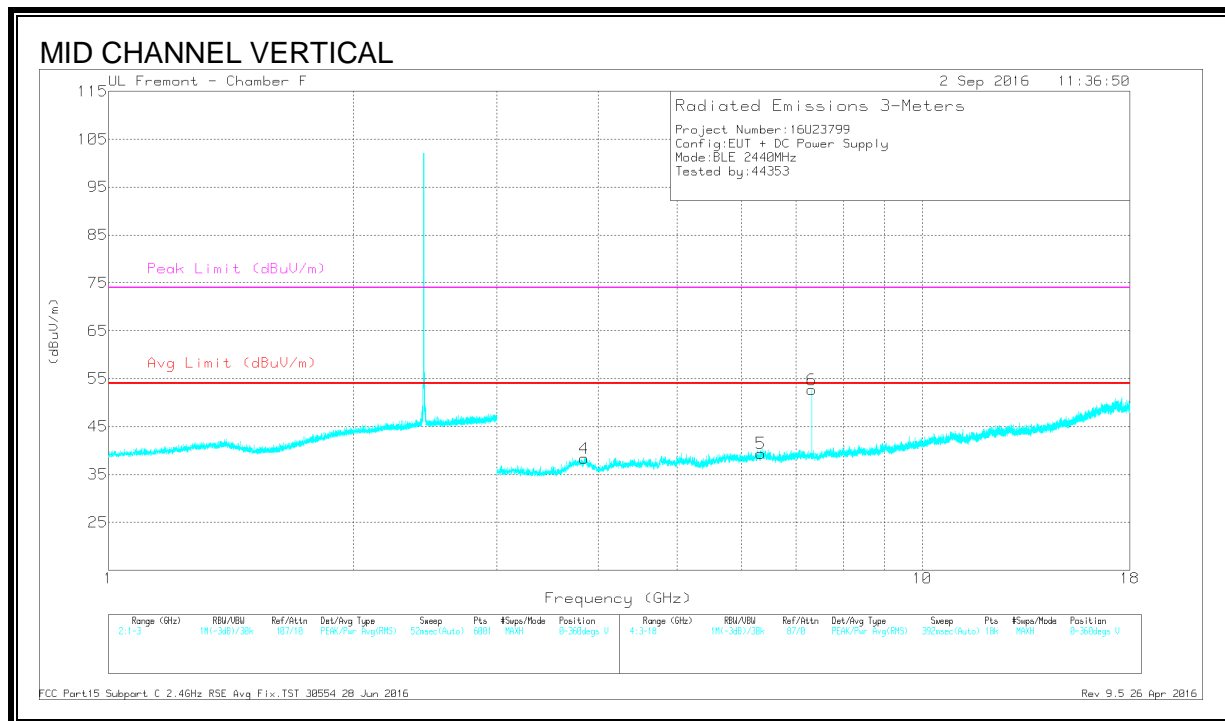
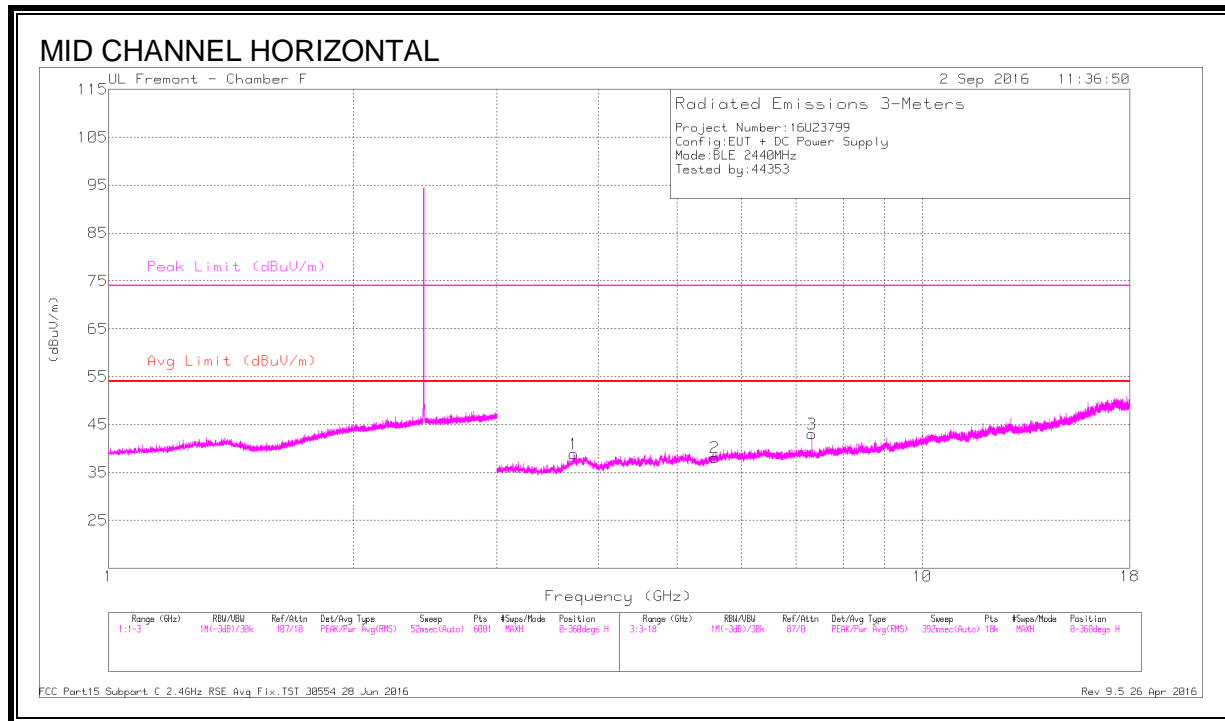
### 8.2.2. HARMONICS AND SPURIOUS EMISSIONS



**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl /Ftr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degrees)	Height (cm)	Polarity
1	* 1.346	41.69	PK2	29.1	-22.1	0	48.69	-	-	74	-25.31	12	132	H
	* 1.344	30.26	MAv1	29.1	-22.1	2.01	39.27	54	-14.73	-	-	12	132	H
4	* 1.476	41.89	PK2	28.3	-22	0	48.19	-	-	74	-25.81	144	366	V
	* 1.477	30.33	MAv1	28.3	-22	2.01	38.64	54	-15.36	-	-	144	366	V
2	* 4.174	39.29	PK2	33.7	-28.5	0	44.49	-	-	74	-29.51	0	183	H
	* 4.172	27.35	MAv1	33.7	-28.6	2.01	34.46	54	-19.54	-	-	0	183	H
3	7.207	39.76	PK2	35.6	-26.4	0	48.96	-	-	74	-25.04	336	320	H
	7.205	29.07	MAv1	35.6	-26.4	2.01	40.28	54	-13.72	-	-	336	320	H
5	* 5.126	37.07	PK2	34.2	-27	0	44.27	-	-	74	-29.73	305	135	V
	* 5.128	26.53	MAv1	34.2	-27	2.01	35.74	54	-18.26	-	-	305	135	V
6	7.207	44.84	PK2	35.6	-26.4	0	54.04	-	-	74	-19.96	90	109	V
	7.205	37.94	MAv1	35.6	-26.4	2.01	49.15	54	-4.85	-	-	90	109	V

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

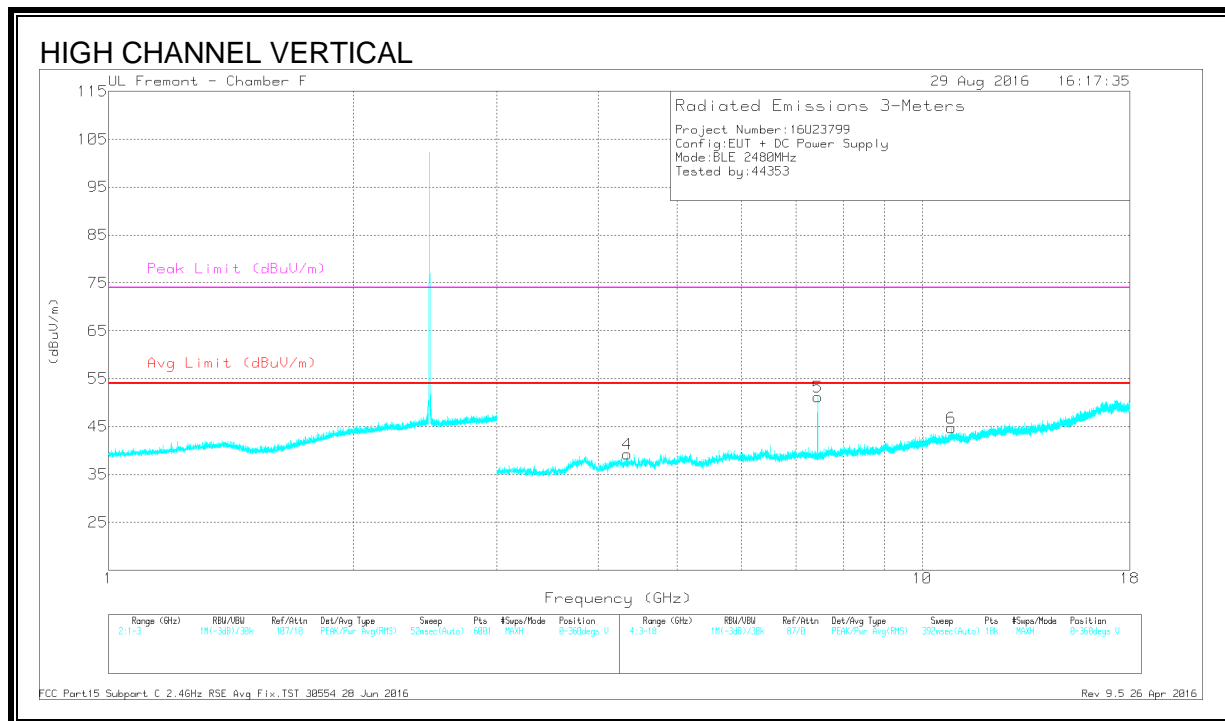
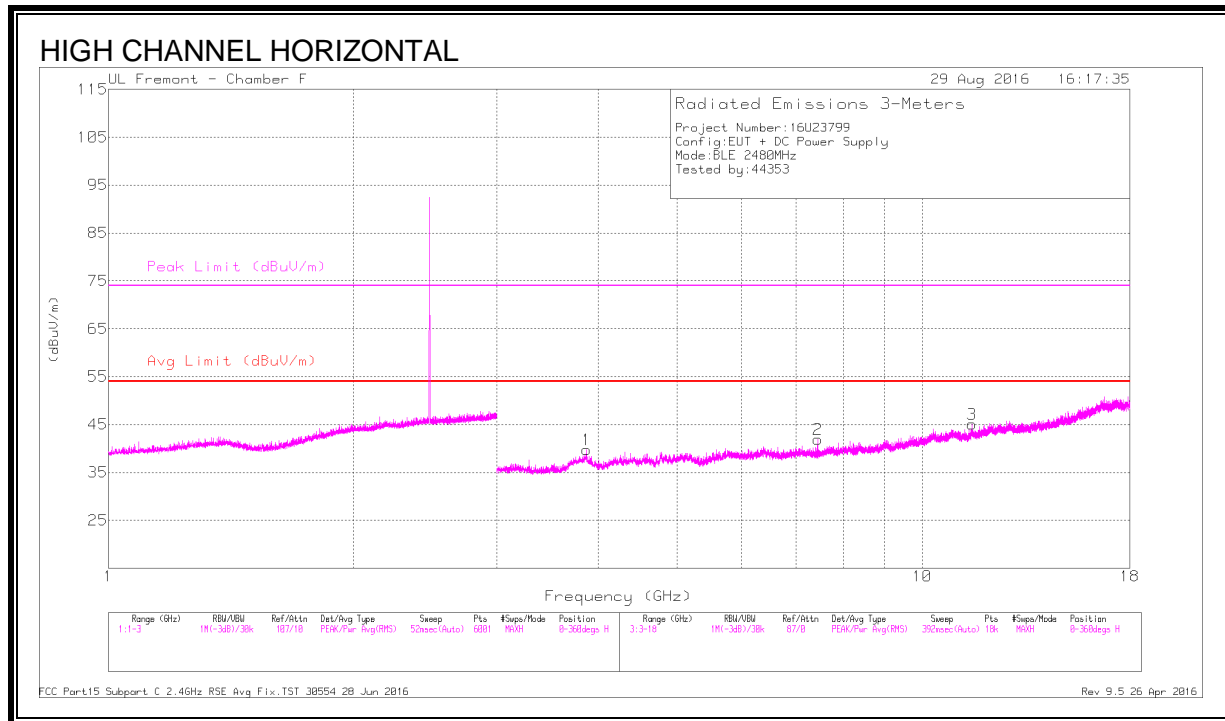


**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fitr/ 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	* 3.733	38.88	PK2	33.4	-29.2	0	43.08	-	-	74	-30.92	269	100	H
	* 3.734	28.53	MAv1	33.4	-29.2	2.01	34.74	54	-19.26	-	-	269	100	H
2	5.555	38.01	PK2	34.6	-28.2	0	44.41	-	-	-	-	312	136	H
	5.554	27.9	MAv1	34.6	-28.2	2.01	36.31	-	-	-	-	312	136	H
3	* 7.319	39.66	PK2	35.5	-26.4	0	48.76	-	-	74	-25.24	148	341	H
	* 7.319	30.22	MAv1	35.5	-26.5	2.01	41.23	54	-12.77	-	-	148	341	H
6	* 7.321	47.99	PK2	35.6	-26.5	0	57.09	-	-	74	-16.91	87	158	V
	* 7.319	41.5	MAv1	35.5	-26.5	2.01	52.51	54	-1.49	-	-	87	158	V
4	* 3.845	38.72	PK2	33.4	-28.2	0	43.92	-	-	74	-30.08	272	201	V
	* 3.848	28.14	MAv1	33.4	-28.2	2.01	35.35	54	-18.65	-	-	272	201	V
5	6.333	36.62	PK2	35.4	-26.9	0	45.12	-	-	-	-	128	266	V
	6.334	26.87	MAv1	35.4	-26.9	2.01	37.38	-	-	-	-	128	266	V

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





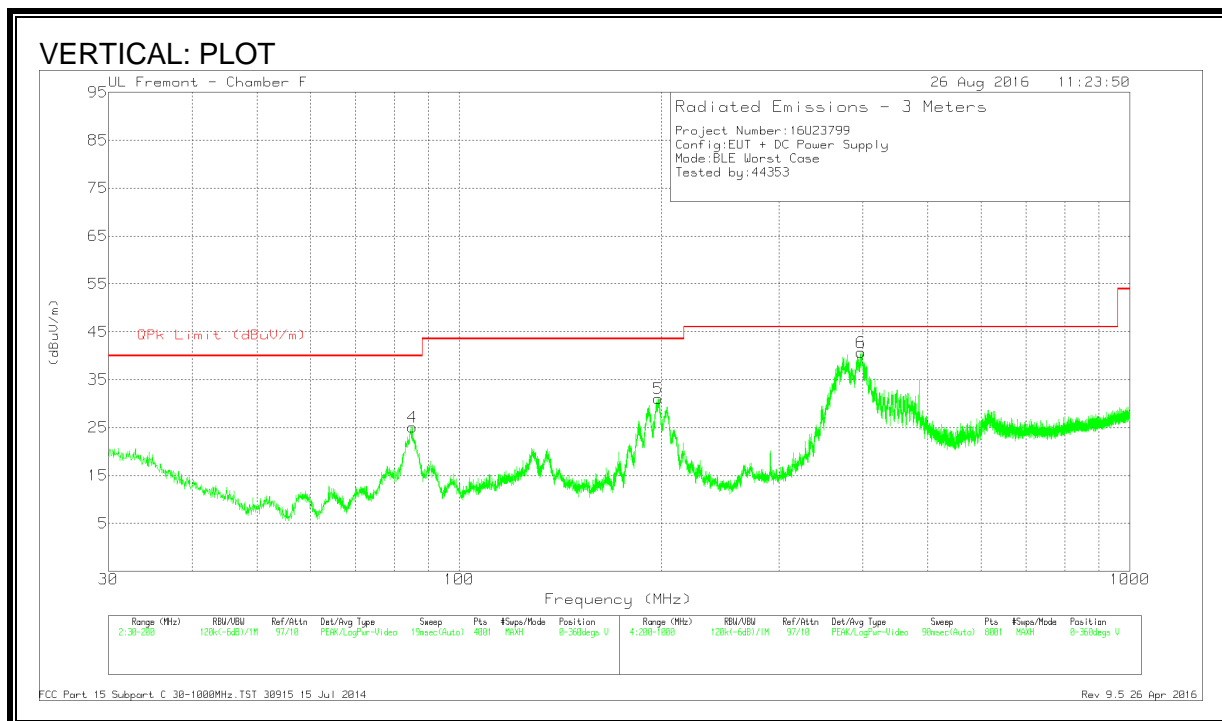
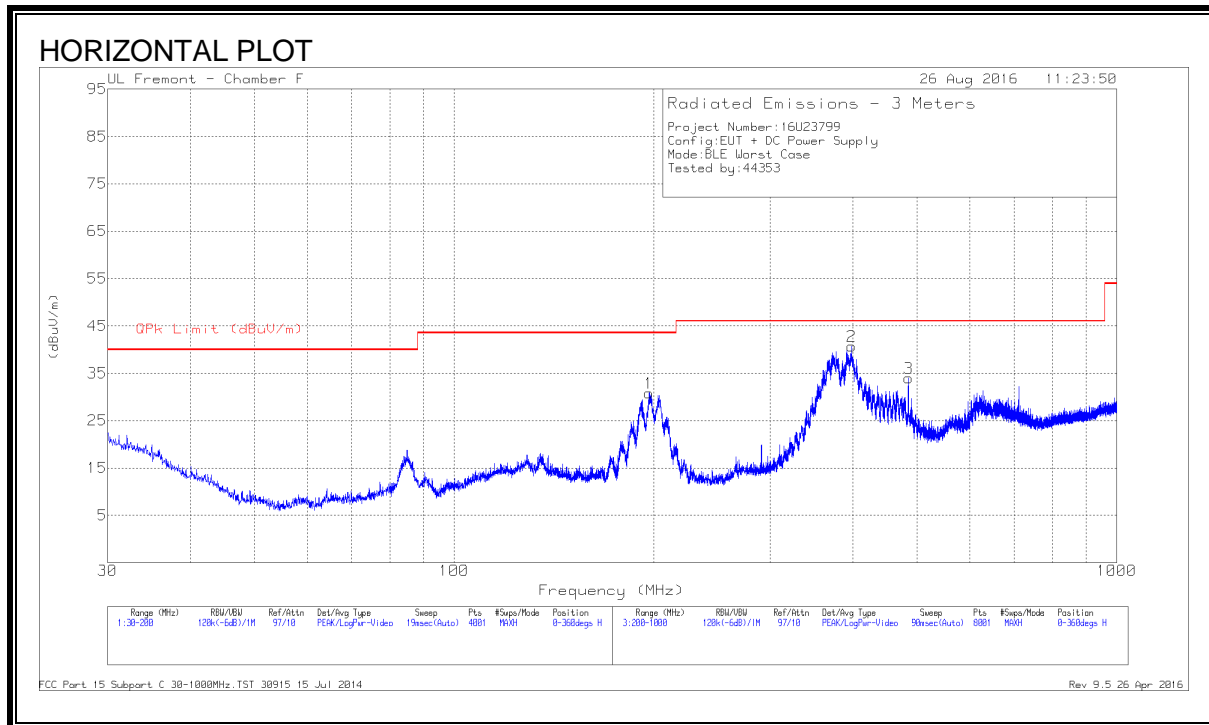
**DATA**

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/FI tr/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
* 7.441	39.19	PK2	35.6	-25.9	0	48.89	-	-	74	-25.11	314	124	H
* 7.439	29.96	MAv1	35.6	-25.8	2.01	41.77	54	-12.23	-	-	314	124	H
* 3.866	38.13	PK2	33.4	-28.2	0	43.33	-	-	74	-30.67	82	101	H
* 3.868	28.36	MAv1	33.4	-28.3	2.01	35.47	54	-18.53	-	-	82	101	H
* 11.517	33.73	PK2	38.1	-21.1	0	50.73	-	-	74	-23.27	82	202	H
* 11.516	23.27	MAv1	38.1	-21.1	2.01	42.28	54	-11.72	-	-	82	202	H
* 7.441	45.08	PK2	35.6	-25.9	0	54.78	-	-	74	-19.22	82	261	V
* 7.439	38.45	MAv1	35.6	-25.8	2.01	50.26	54	-3.74	-	-	82	261	V
* 4.337	38.72	PK2	33.8	-28.8	0	43.72	-	-	74	-30.28	82	202	V
* 4.337	28.04	MAv1	33.8	-28.8	2.01	35.05	54	-18.95	-	-	82	202	V
* 10.868	33.85	PK2	37.8	-21.5	0	50.15	-	-	74	-23.85	82	100	V
* 10.867	23.7	MAv1	37.8	-21.5	2.01	42.01	54	-11.99	-	-	82	100	V

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

### 8.3. WORST-CASE BELOW 1 GHz

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



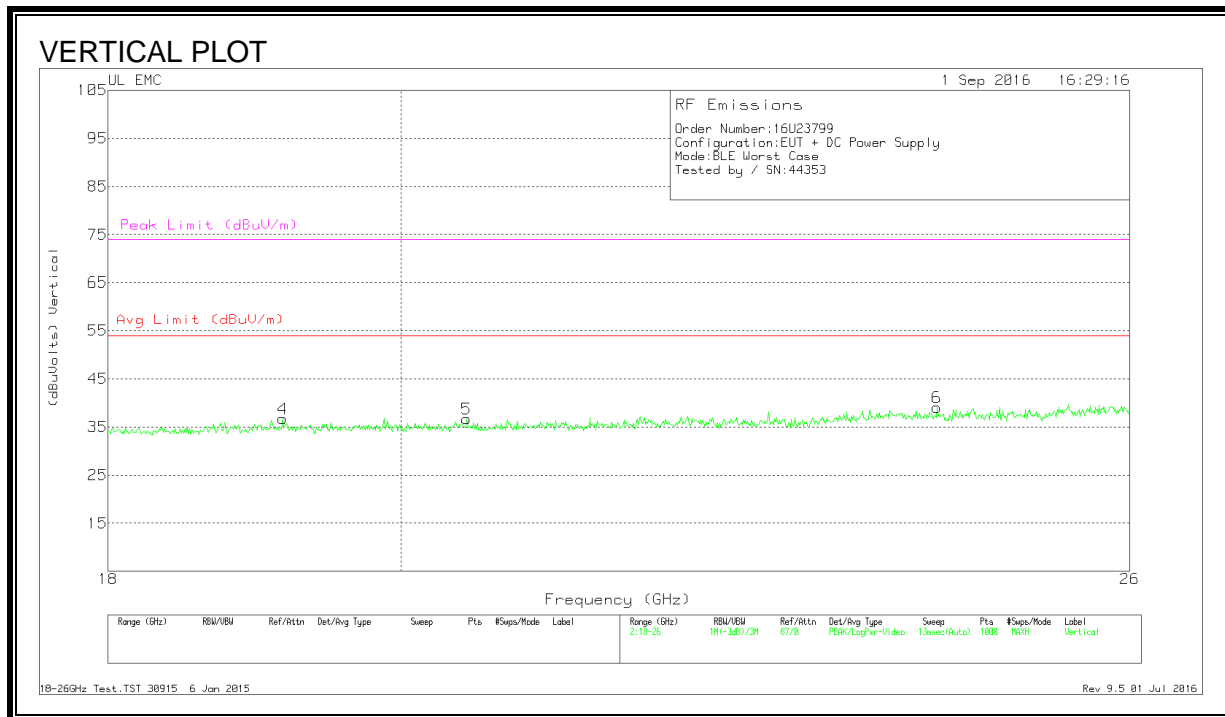
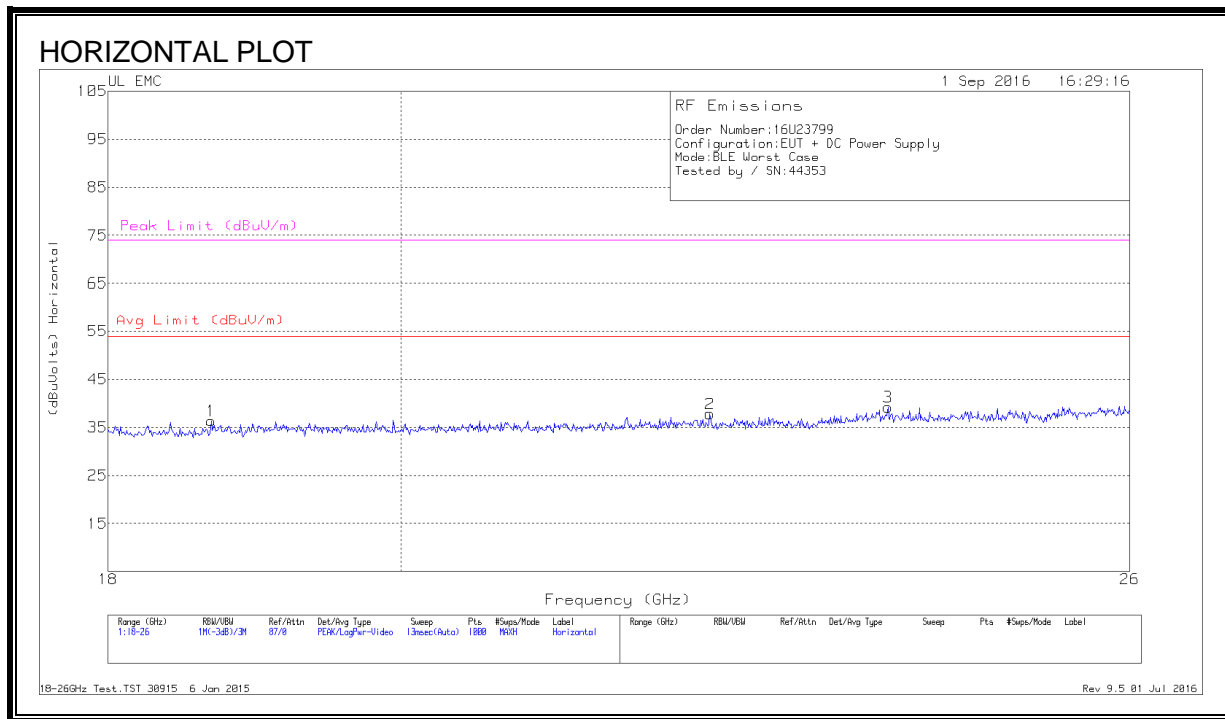
**DATA**

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AFT185 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	196.8975	45.39	Pk	15.9	-30.5	30.79	43.52	-12.73	0-360	98	H
4	85.1225	44.95	Pk	11.4	-31.3	25.05	40	-14.95	0-360	100	V
5	198.1725	45.51	Pk	16.1	-30.5	31.11	43.52	-12.41	0-360	100	V
2	398.3	50.46	Pk	19.5	-29.3	40.66	46.02	-5.36	0-360	100	H
3	484.9	41.23	Pk	21.8	-29.1	33.93	46.02	-12.09	0-360	199	H
6	397.4	50.65	Pk	19.4	-29.4	40.65	46.02	-5.37	0-360	100	V

Pk - Peak detector

### 8.4. WORST-CASE 18 to 26 GHz

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



**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	18.68	38.09	Pk	32.4	-24.6	-9.5	36.39	54	-17.61	74	-37.61
2	22.352	38.53	Pk	33.5	-24.7	-9.5	37.83	54	-16.17	74	-36.17
3	23.832	39.11	Pk	33.9	-24.3	-9.5	39.21	54	-14.79	74	-34.79
4	19.168	38.24	Pk	32.7	-24.7	-9.5	36.74	54	-17.26	74	-37.26
5	20.48	38.68	Pk	32.9	-25.4	-9.5	36.68	54	-17.32	74	-37.32
6	24.256	38.98	Pk	33.8	-24.2	-9.5	39.08	54	-14.92	74	-34.92

Pk - Peak detector

## 9. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	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

**DATA**

FCC15 CE Class A 150kHz-30MHz Stepping.TST 30915 24 Feb 2016

Rev 9.5 26 May 2015

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	.204	-1.3	Qp	0	0	10.1	8.8	63.45	-54.65	-	-
2	.204	-2.91	Ca	0	0	10.1	7.19	-	-	53.45	-46.26
3	2.49675	-3.51	Qp	0	.1	10.1	6.69	56	-49.31	-	-
4	2.49675	-5.19	Ca	0	.1	10.1	5.01	-	-	46	-40.99
5	16.99125	13.15	Qp	0	.2	10.3	23.65	60	-36.35	-	-
6	16.90125	7.11	Ca	0	.2	10.3	17.61	-	-	50	-32.39
7	21.66675	5.69	Qp	0	.2	10.4	16.29	60	-43.71	-	-
8	21.66675	4.88	Ca	0	.2	10.4	15.48	-	-	50	-34.52
9	23.1315	7.31	Qp	.1	.2	10.4	18.01	60	-41.99	-	-
10	23.1315	6.39	Ca	.1	.2	10.4	17.09	-	-	50	-32.91
11	26.49075	7.79	Qp	.1	.3	10.5	18.69	60	-41.31	-	-
12	26.49075	7.02	Ca	.1	.3	10.5	17.92	-	-	50	-32.08

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	.204	-3.44	Qp	0	0	10.1	6.66	63.45	-56.79	-	-
14	.204	-5.06	Ca	0	0	10.1	5.04	-	-	53.45	-48.41
15	6.55575	-1.58	Qp	0	.1	10.2	8.72	60	-51.28	-	-
16	6.558	-3.52	Ca	0	.1	10.2	6.78	-	-	50	-43.22
17	16.97325	13.75	Qp	0	.2	10.3	24.25	60	-35.75	-	-
18	17.08575	7.54	Ca	0	.2	10.3	18.04	-	-	50	-31.96
19	21.66675	1.65	Qp	0	.2	10.4	12.25	60	-47.75	-	-
20	21.66675	-1.18	Ca	0	.2	10.4	10.42	-	-	50	-39.58
21	23.1315	6.1	Qp	.1	.2	10.4	16.8	60	-43.2	-	-
22	23.1315	4.5	Ca	.1	.2	10.4	15.2	-	-	50	-34.8
23	26.49075	5.14	Qp	.1	.3	10.5	16.04	60	-43.96	-	-
24	26.49075	3.29	Ca	.1	.3	10.5	14.19	-	-	50	-35.81

Qp - Quasi-Peak detector

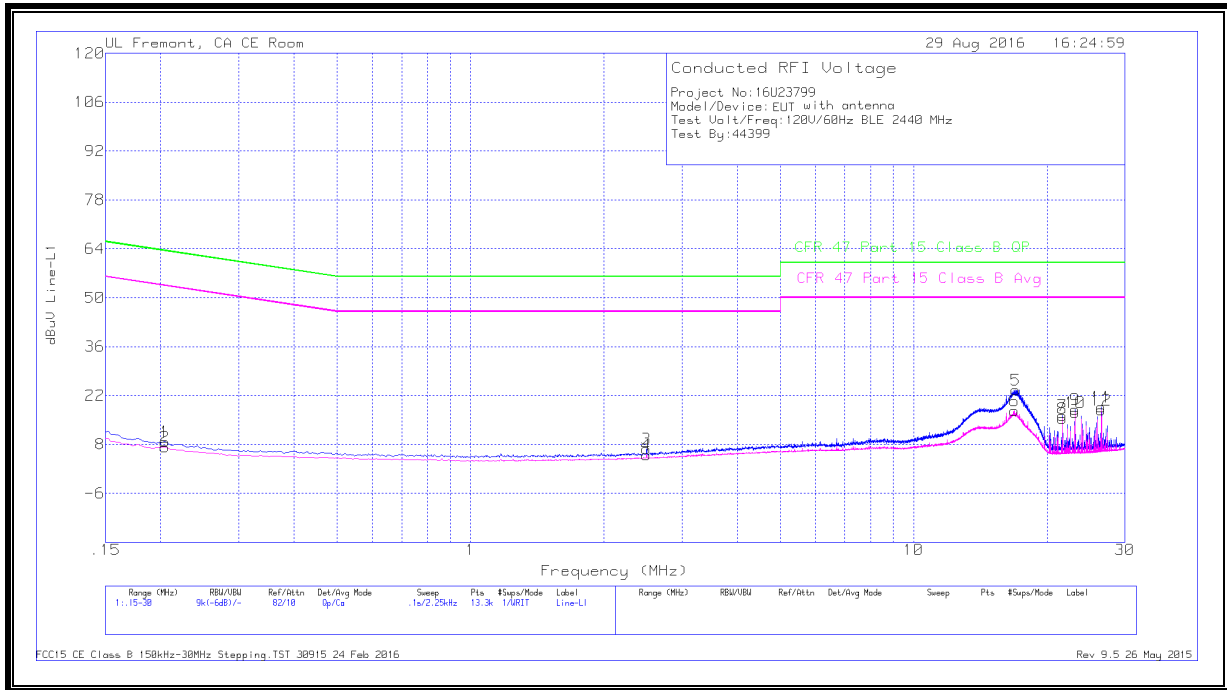
Ca - CISPR average detection

FCC15 CE Class B 150kHz-30MHz Stepping.TST 30915 24 Feb 2016

Rev 9.5 26 May 2015



**LINE 1 RESULTS**



**LINE 2 RESULTS**

