



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

**BLUETOOTH LOW ENERGY
CERTIFICATION TEST REPORT**

FOR

CELLULAR PHONE WITH BLUETOOTH AND WLAN RADIOS

MODEL NUMBER: A1785

**FCC ID: BCG-E3088A
IC: 579C-E3088A**

REPORT NUMBER: 16U23308-E6V1

ISSUE DATE: AUGUST 26, 2016

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

Prepared by
UL VERIFICATION SERVICES INC.
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP[®]

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Revision History

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V1	8/26/2016	Initial Issue	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: CELLULAR PHONE WITH BLUETOOTH AND WLAN RADIOS

MODEL: A1785

SERIAL NUMBER: C39S602ZHLMT (CONDUCTED), C39S602AHLMT (RADIATED)

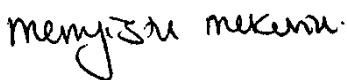
DATE TESTED: AUGUST 25 TO AUGUST 26, 2016

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.

Approved & Released For
UL Verification Services Inc. By:



MEGISTU MEKURIA
SENIOR ENGINEER
UL VERIFICATION SERVICES INC.

Prepared By:



ERIC YU
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, 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
<input type="checkbox"/> Chamber A	<input type="checkbox"/> Chamber D
<input type="checkbox"/> Chamber B	<input checked="" type="checkbox"/> Chamber E
<input type="checkbox"/> Chamber C	<input type="checkbox"/> Chamber F
	<input type="checkbox"/> Chamber G
	<input checked="" 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	$\pm 3.84 \text{ dB}$
Conducted Disturbance, 0.15 to 30 MHz	$\pm 3.65 \text{ dB}$
Radiated Disturbance, 9KHz to 30 MHz	$\pm 3.15 \text{ dB}$
Radiated Disturbance, 30 to 1000 MHz	$\pm 5.36 \text{ dB}$
Radiated Disturbance, 1000 to 18000 MHz	$\pm 4.32 \text{ dB}$
Radiated Disturbance, 18000 to 26000 MHz	$\pm 4.45 \text{ dB}$
Radiated Disturbance, 26000 to 40000 MHz	$\pm 5.24 \text{ dB}$

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT Model A1785 is a mobile phone with multimedia functions (music, application support, and video), cellular GSM/GPRS/EGPRS/CDMA/WCDMA/HSPA+/DC-HSDPA/LTE-radio, IEEE 802.11a/b/g/n/ac, NFC and Bluetooth radio. The rechargeable battery is not user accessible

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	16.62	45.92

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Gain (dBi)
2.4	-2.20

5.4. SOFTWARE AND FIRMWARE

The firmware version installed in the EUT during testing was 14.1.39.180
The test utility software used during testing was BlueTool.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X/Y/Z, it was determined that X orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in X orientation.

BLE: 1 Mbps.

There are two vendors of the WiFi/Bluetooth radio modules: variant 1 and variant 2. The WiFi/Bluetooth radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances.

Baseline testing was performed on the two variants to determine the worst case on all conducted power and radiated emissions.

For simultaneous transmission of multiple channels from the same antenna in the 2.4GHz and 5GHz bands, tests were conducted for various configurations having the highest power. No noticeable new emission was found.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Dell	Latitude 3540	9J6WQZ1	NA
Laptop Power Supply	Dell	LA65NM130	OJNKWD	NA

I/O CABLES (CONDUCTED TEST)

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

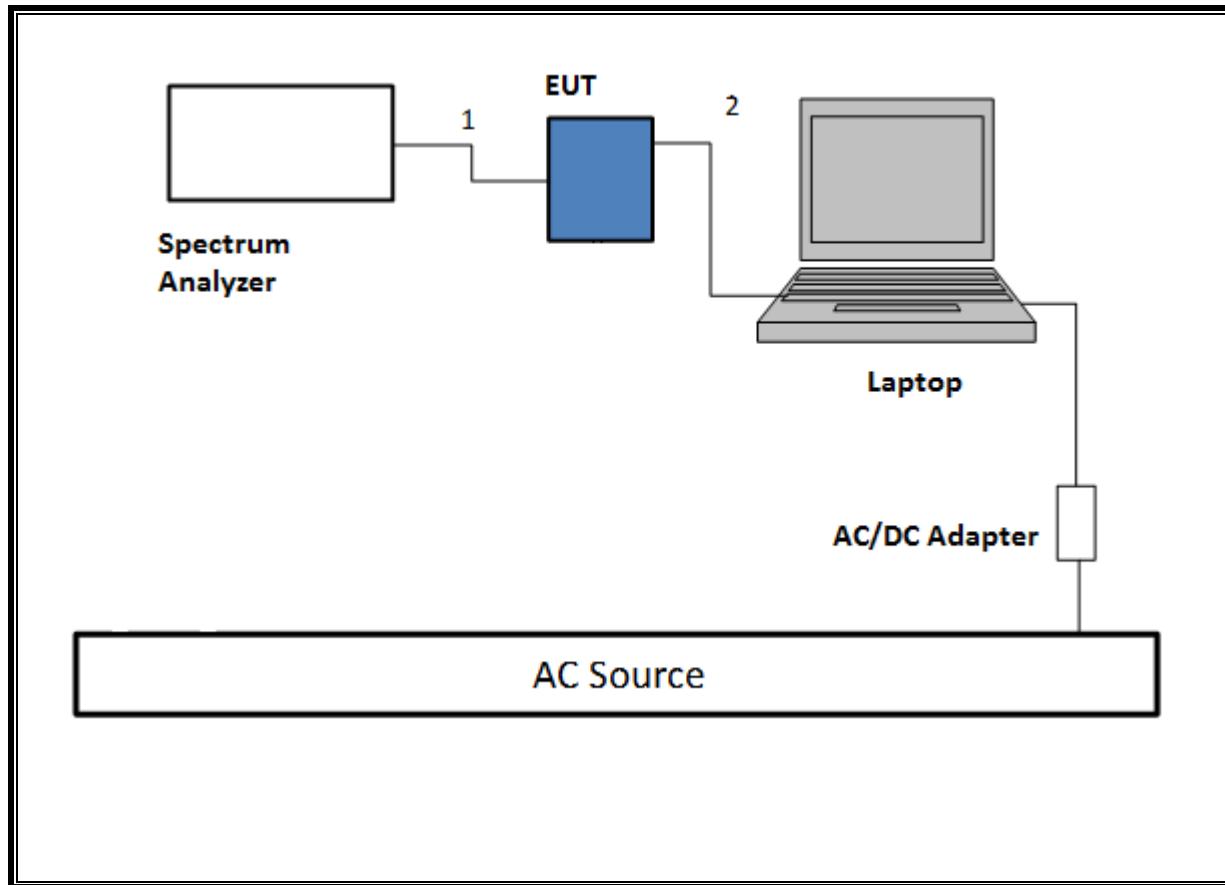
I/O CABLES (AC LINE CONDUCTED: AC/DC ADAPTER)

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

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.

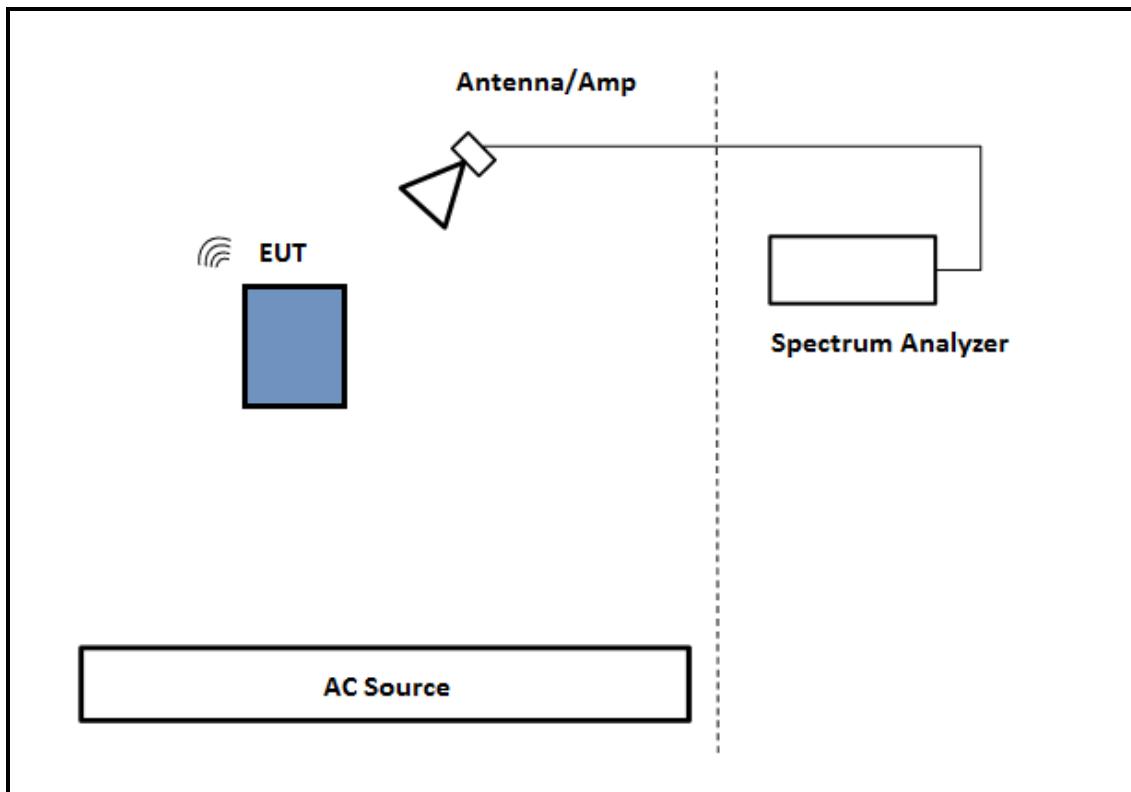
SETUP DIAGRAM



TEST SETUP- RADIATED-ABOVE 1 GHZ

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

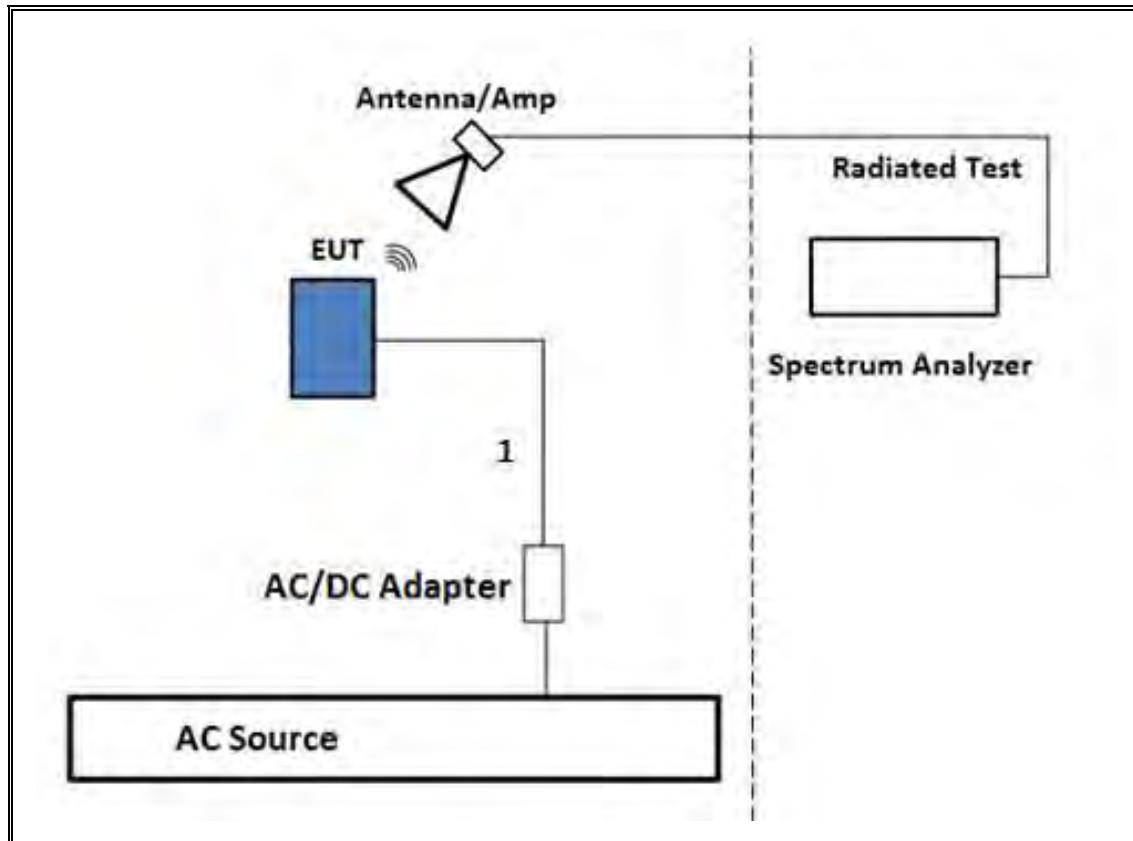
SETUP DIAGRAM



TEST SETUP- BELOW 1GHZ

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

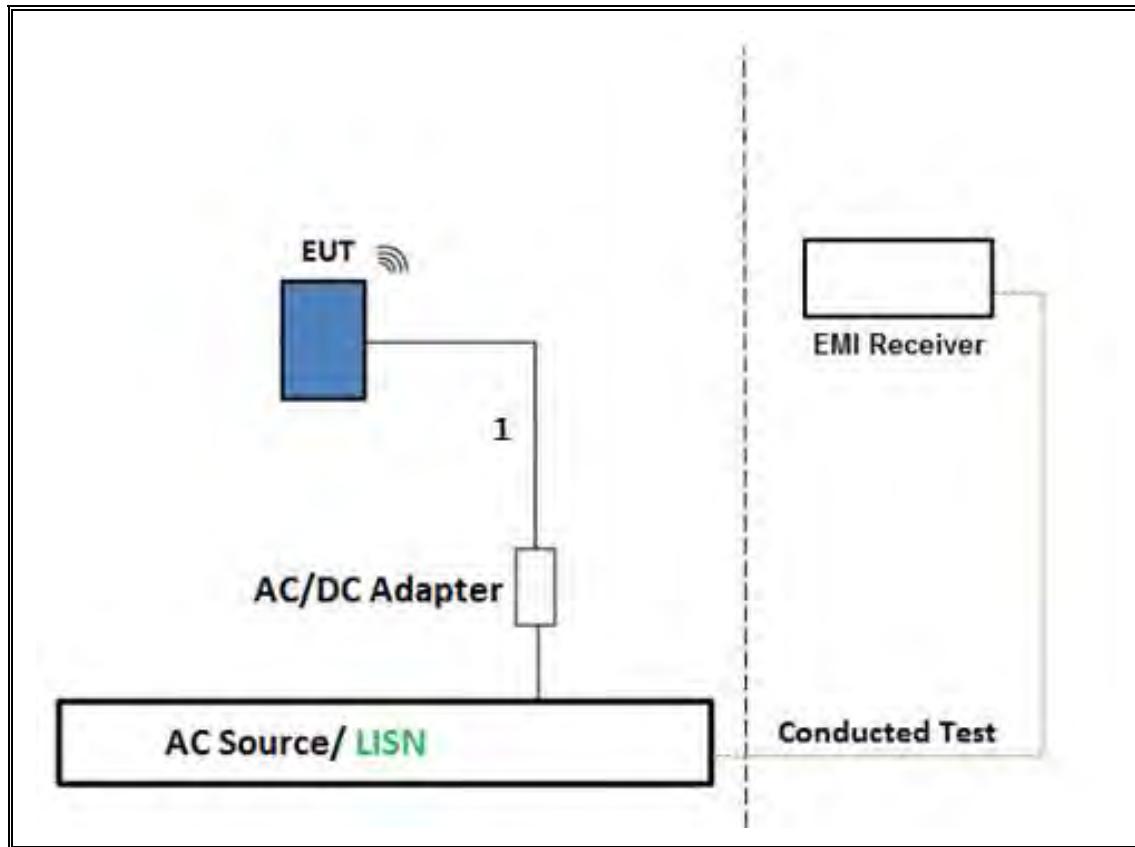
SETUP DIAGRAM



TEST SETUP- AC LINE CONDUCTED: AC/DC ADAPTER

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

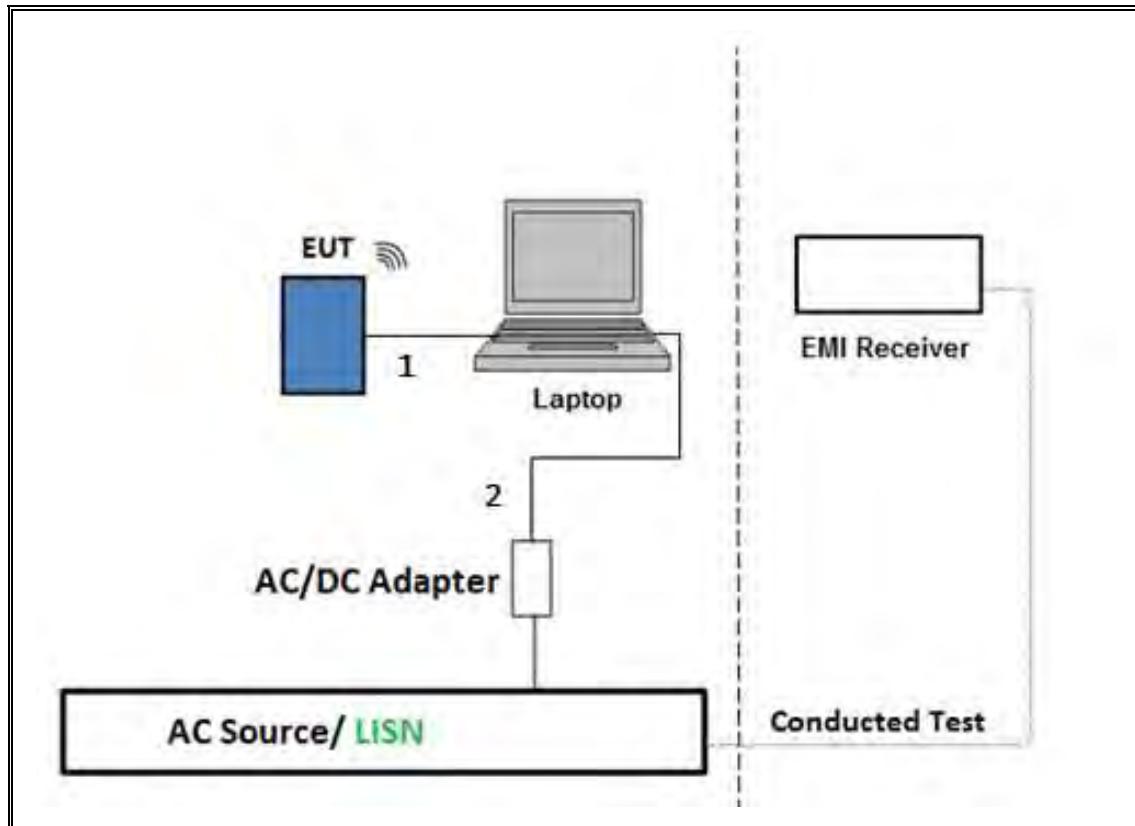
SETUP DIAGRAM



TEST SETUP- AC LINE CONDUCTED: LAPTOP CONFIGURATION

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

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	T Number	Cal Due
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T863	4/26/2017
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T900	5/3/2017
Amplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	T495	10/20/2016
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T835	6/18/2017
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	T906	2/3/2017
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	T1454	12/9/2016
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	N9030A	T340	11/15/2016
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	T1436	12/19/2016
LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2-01	T1310	6/8/2017
AC Source	Shaffner	NSG 1007	T134	9/11/2016
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

**Testing is completed before equipment expiration date

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.

7.2. ON TIME, DUTY CYCLE

LIMITS

None; for reporting purposes only.

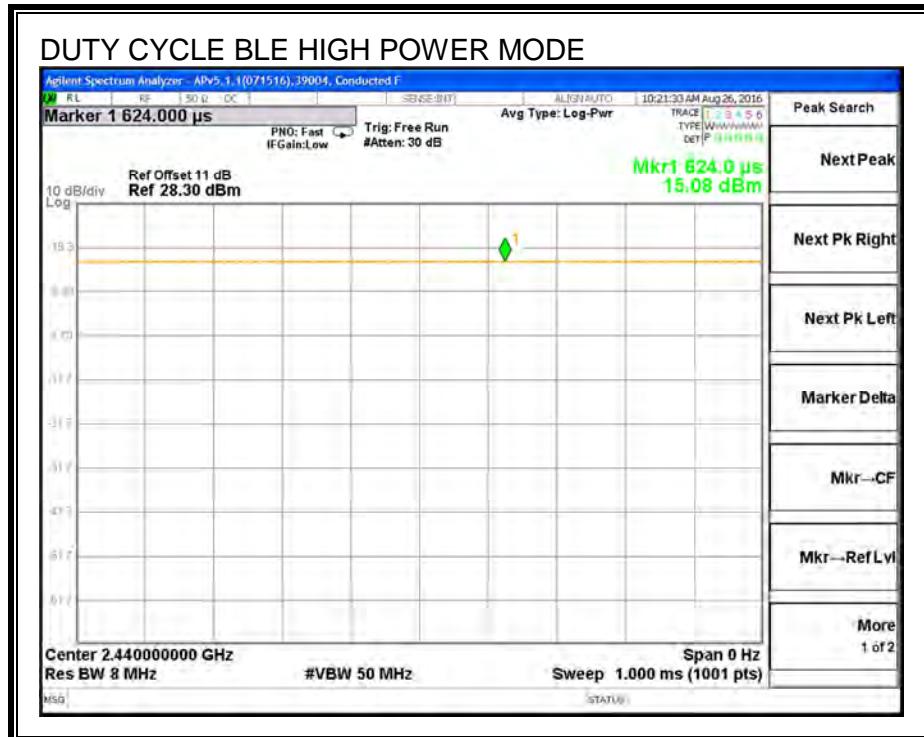
PROCEDURE

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 LOW POWER	1.000	1.000	1.000	100.00%	0.00	0.010
BLE HIGH POWER	1.000	1.000	1.000	100.00%	0.00	0.010

DUTY CYCLE PLOTS



7.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-247 (5.2) (1)

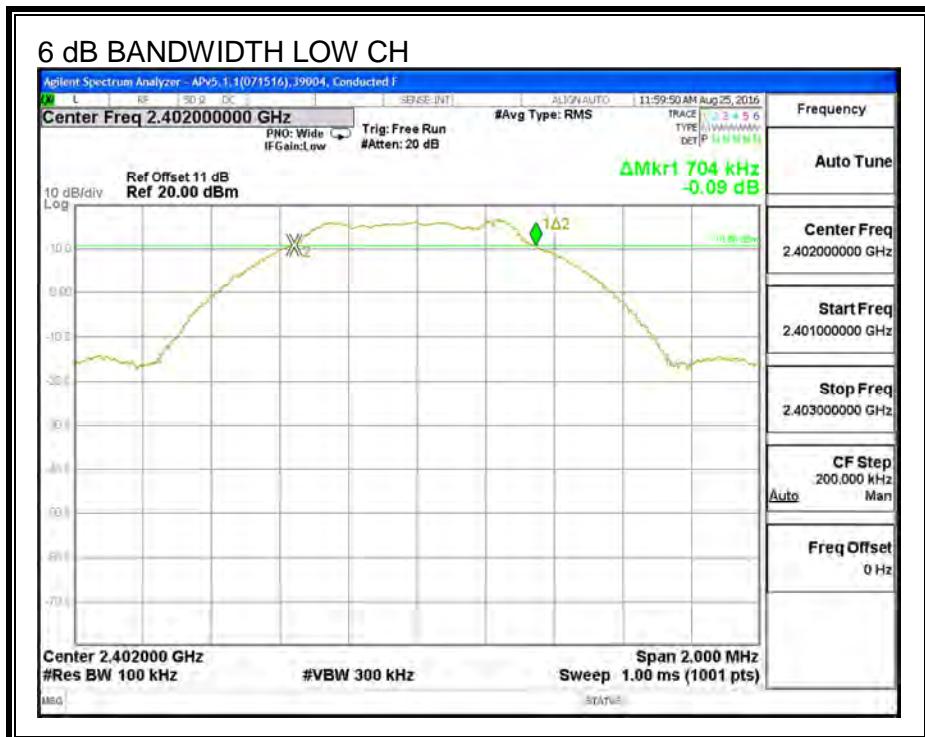
The minimum 6 dB bandwidth shall be at least 500 kHz.

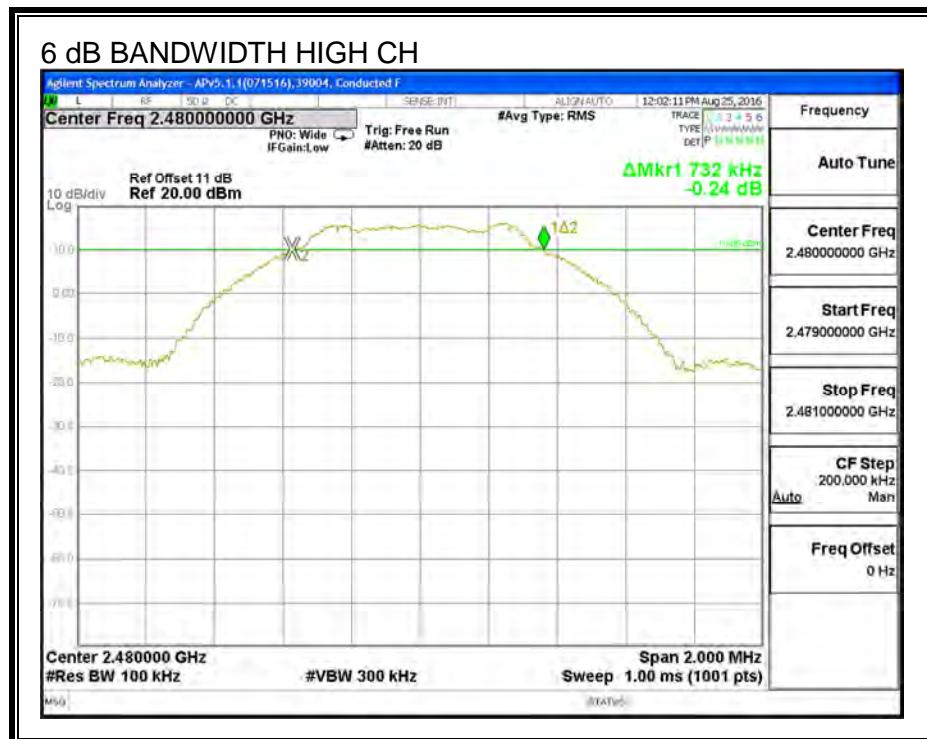
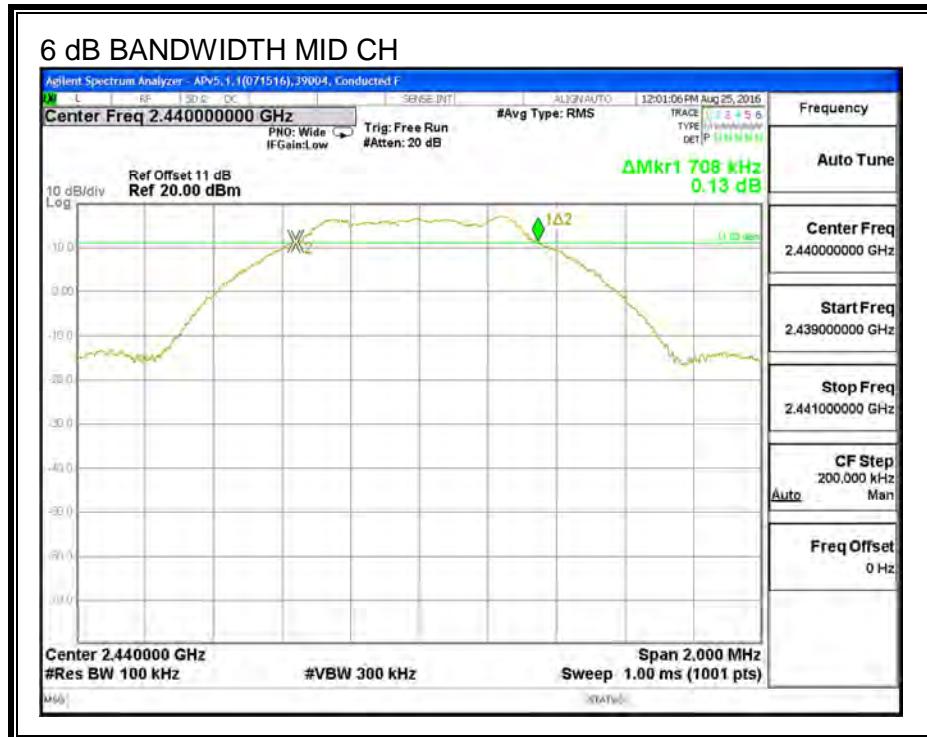
RESULTS

HIGH POWER

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.704	0.5
Middle	2440	0.708	0.5
High	2480	0.732	0.5

6 dB BANDWIDTH HIGH POWER





7.4. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

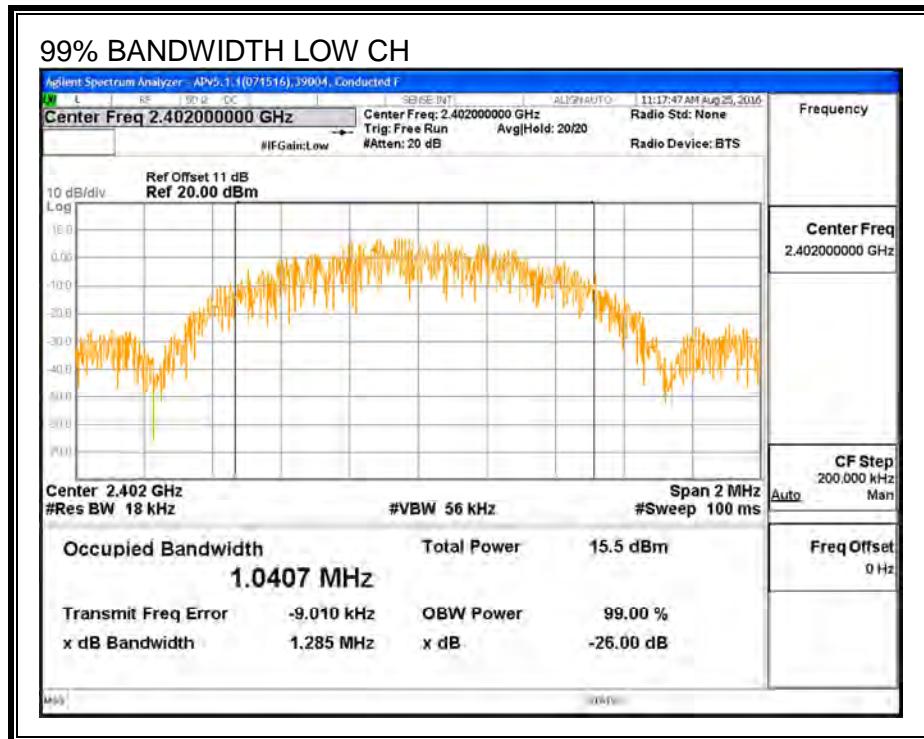
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

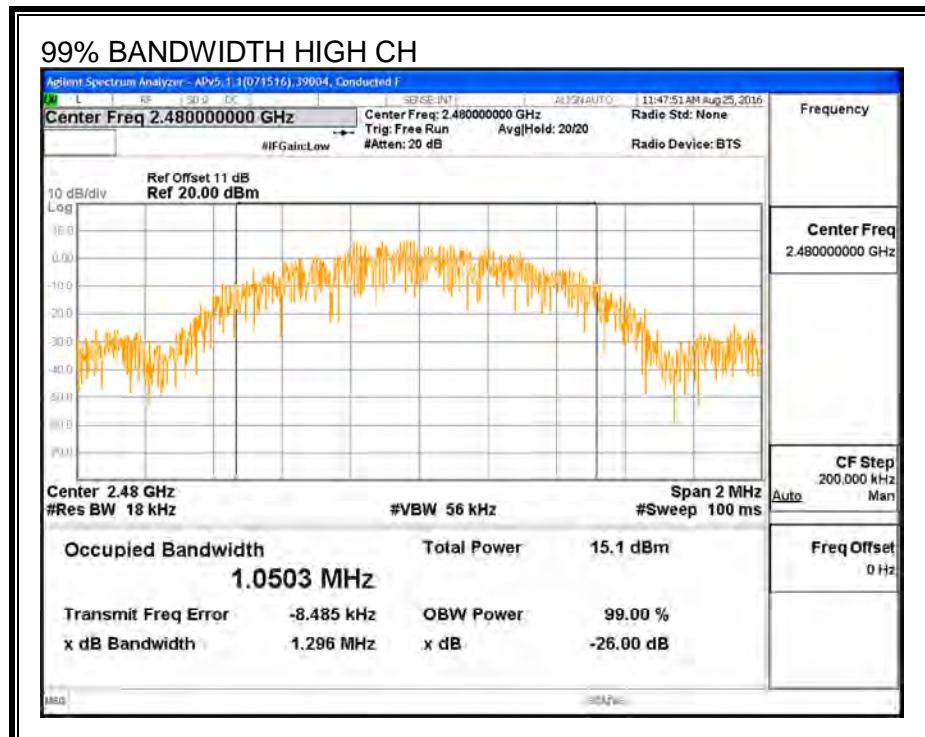
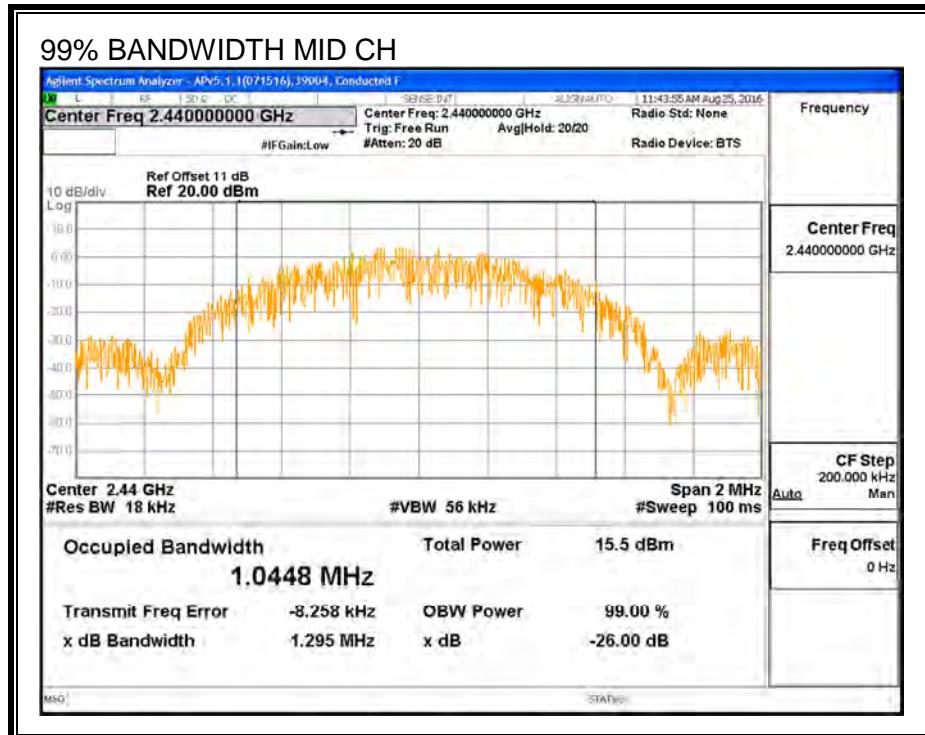
RESULTS

HIGH POWER

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0407
Middle	2440	1.0448
High	2480	1.0503

99% BANDWIDTH HIGH POWER





7.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

ID:	39004	Date:	6/26/16
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HIGH POWER

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	16.12
Middle	2440	16.45
High	2480	16.20

7.6. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-247 (5.4) (4)

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

RESULTS

ID:	39004	Date:	8/26/16
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HIGH POWER

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	16.30	30	-13.700
Middle	2440	16.62	30	-13.380
High	2480	16.35	30	-13.650

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.

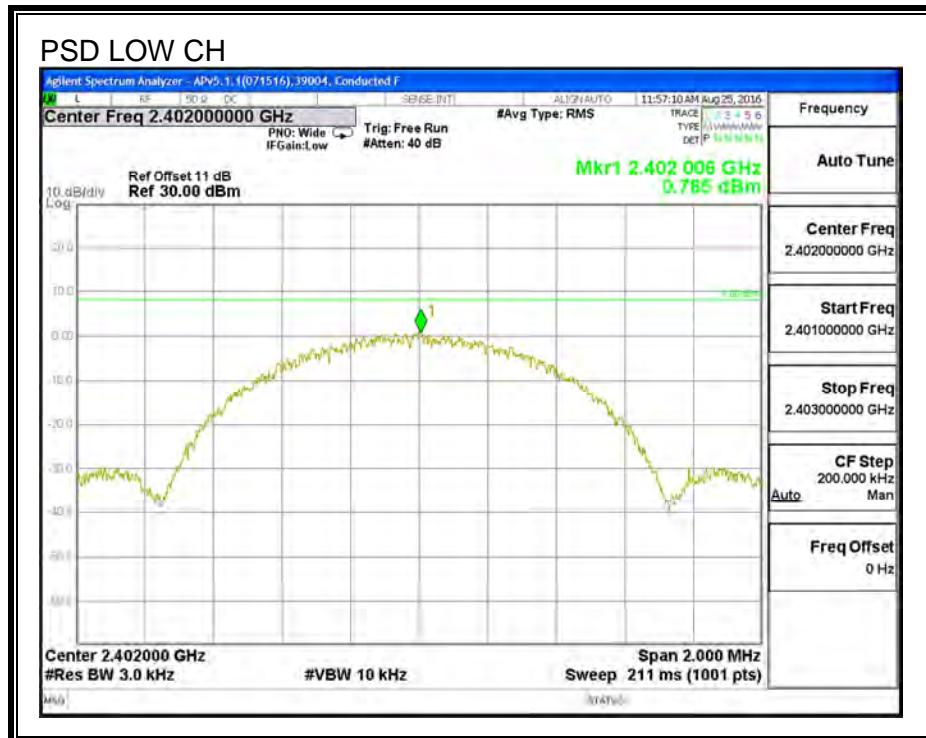
RESULTS

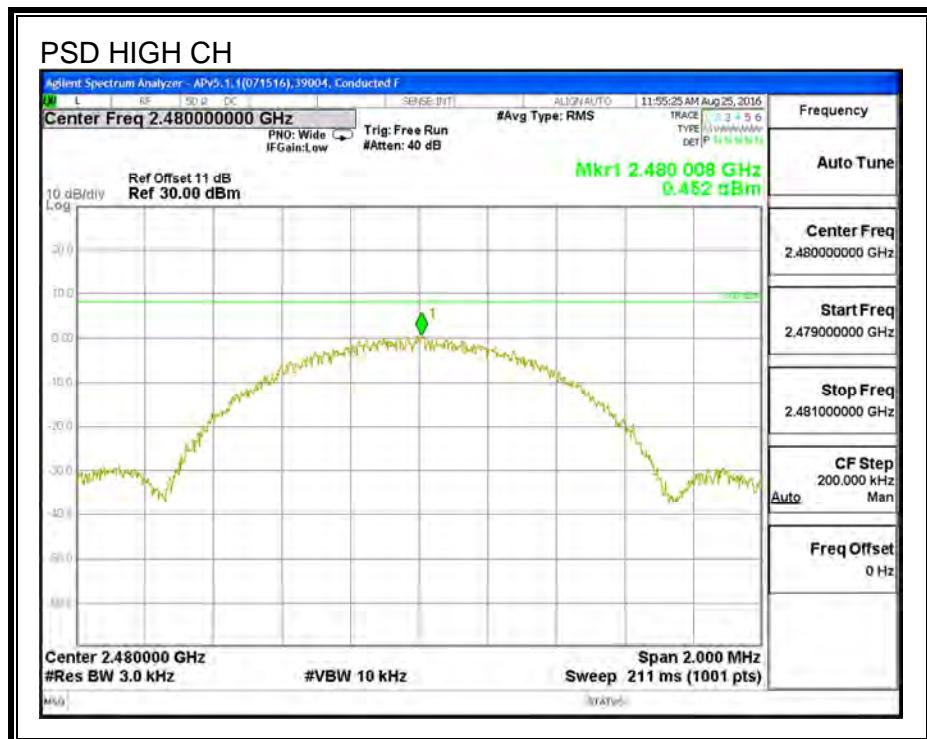
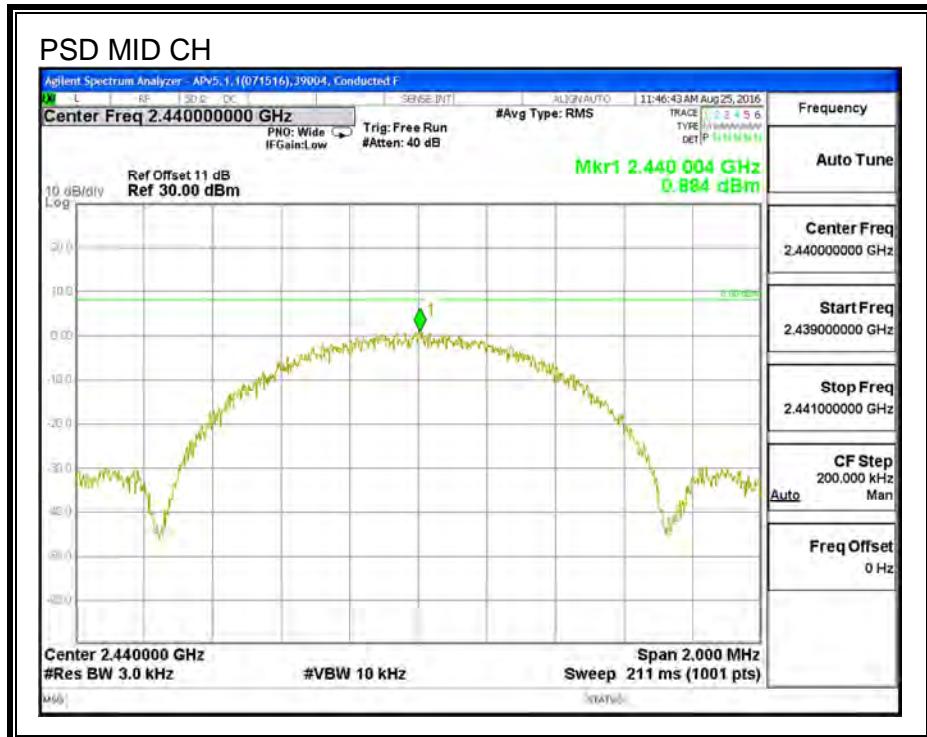
HIGH POWER

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	0.765	8	-7.24
Middle	2440	0.894	8	-7.11
High	2480	0.452	8	-7.55

Note: Power spectral density to high power mode was originally tested with high power than recorded under average power data.

POWER SPECTRAL DENSITY HIGH POWER





7.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

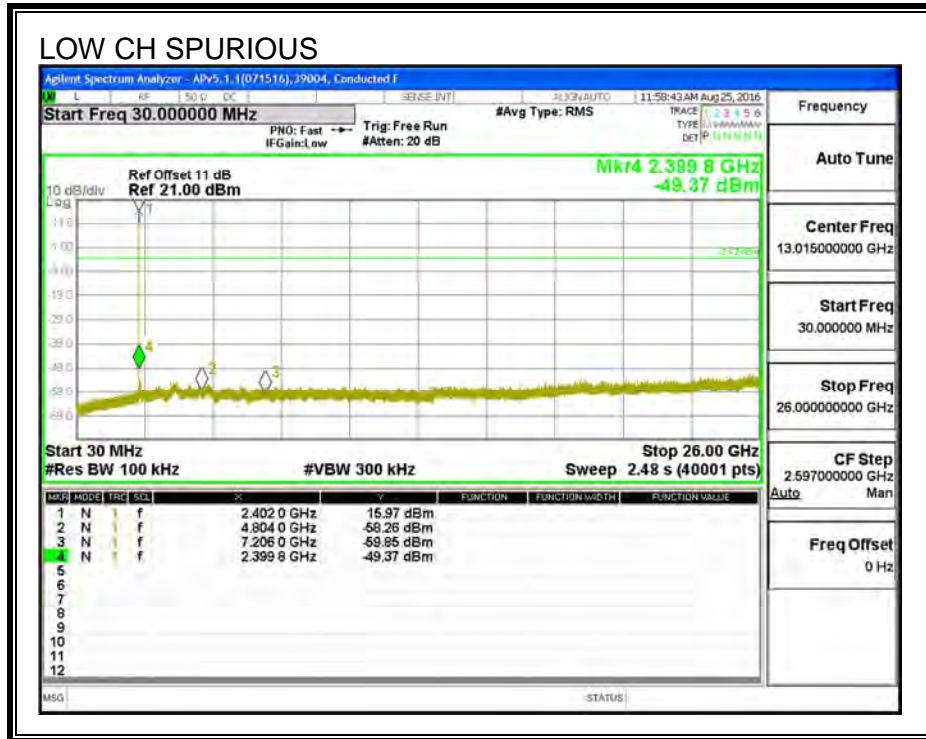
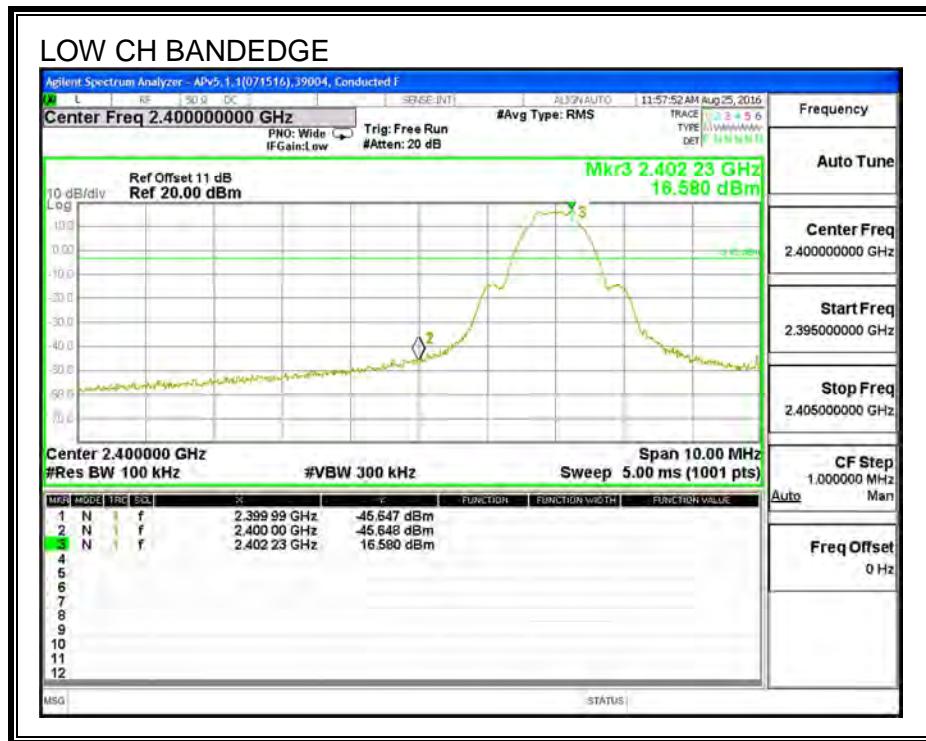
IC RSS-247 (5.5)

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

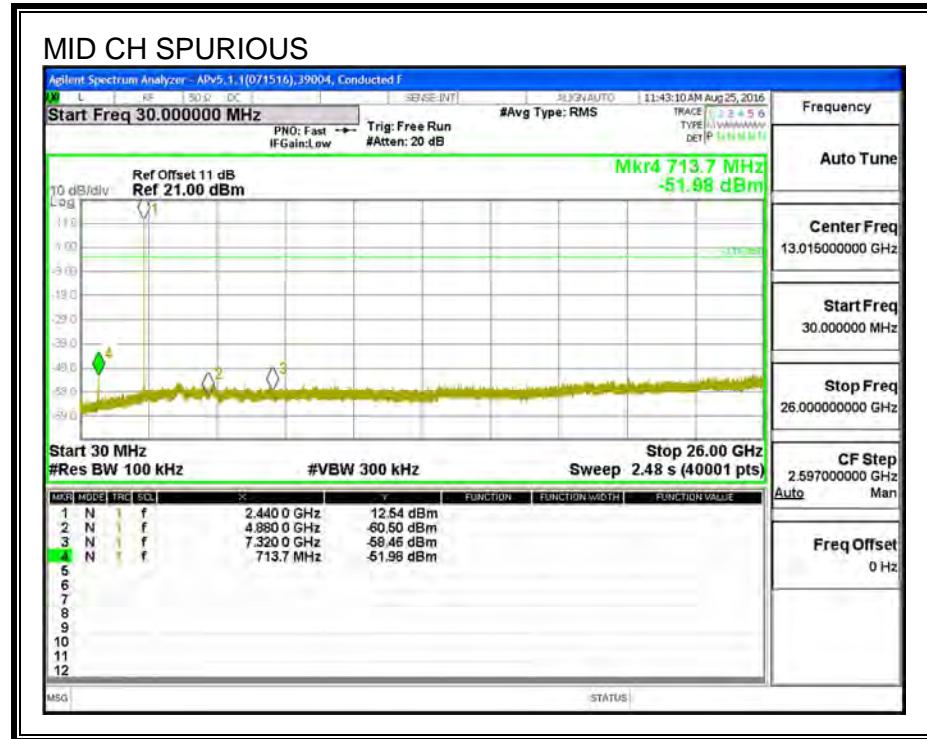
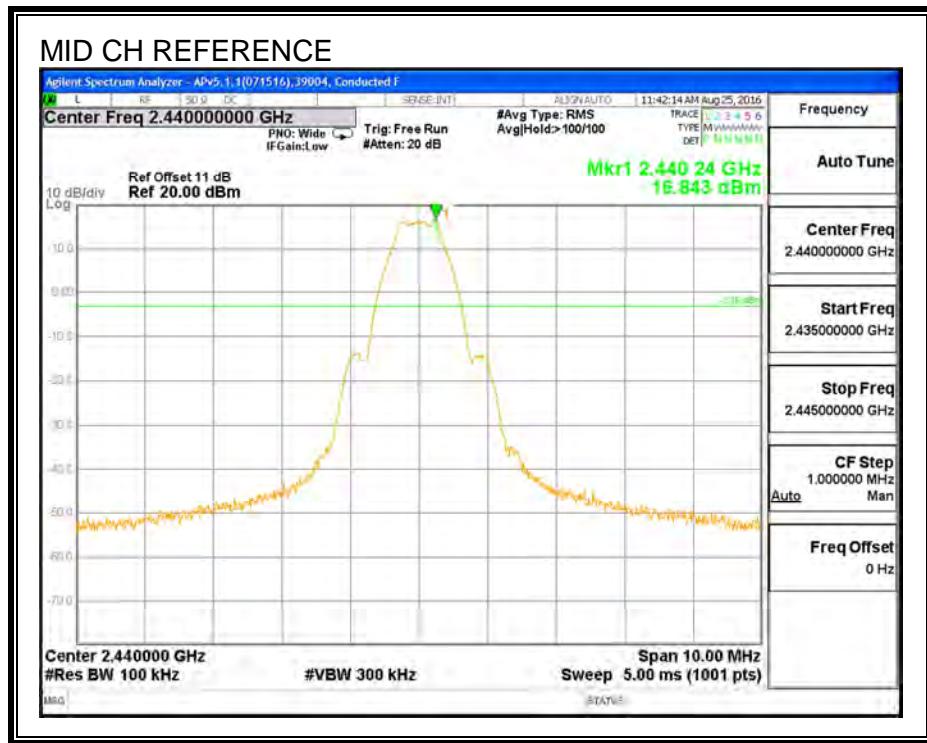
RESULTS

Note: Conducted Spurious Emissions to high power mode was originally tested with high power than recorded under average power data.

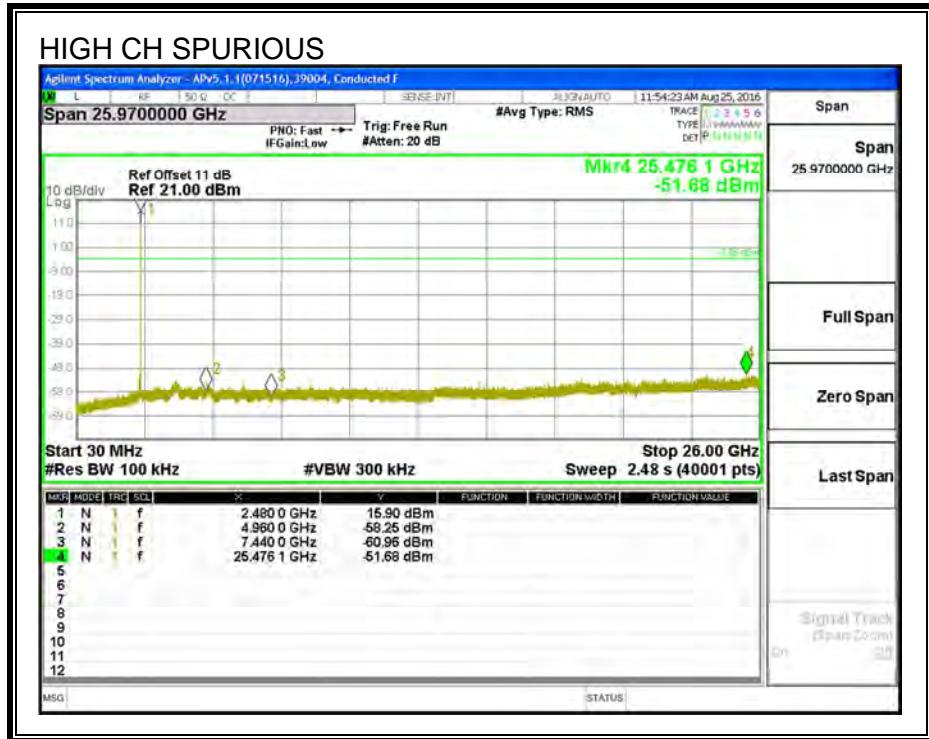
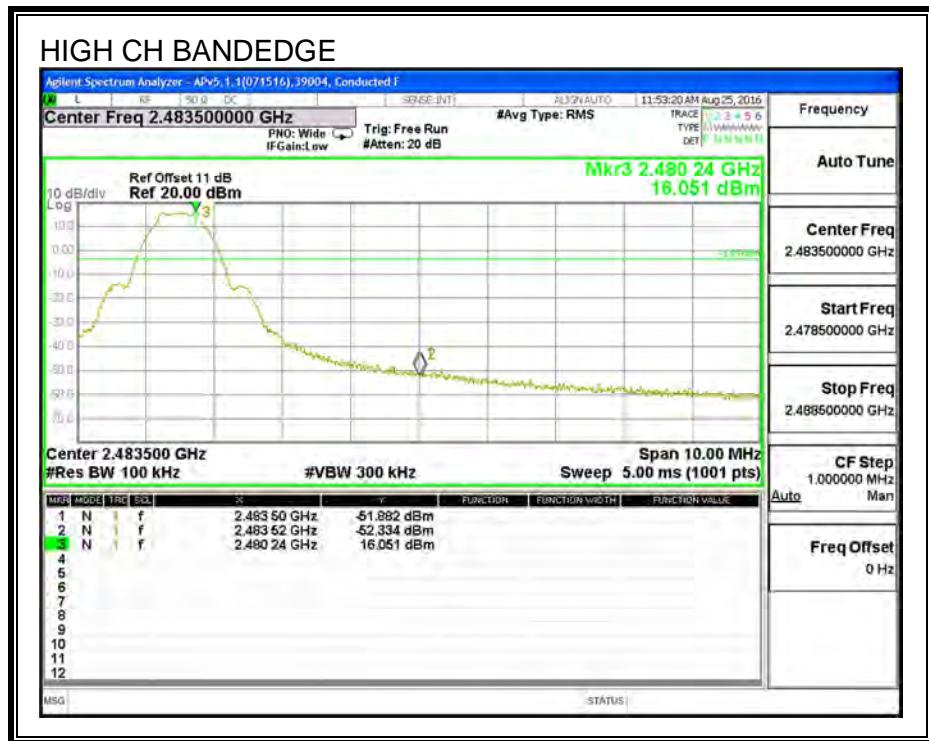
SPURIOUS EMISSIONS, LOW CHANNEL



SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL



8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

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

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, 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.

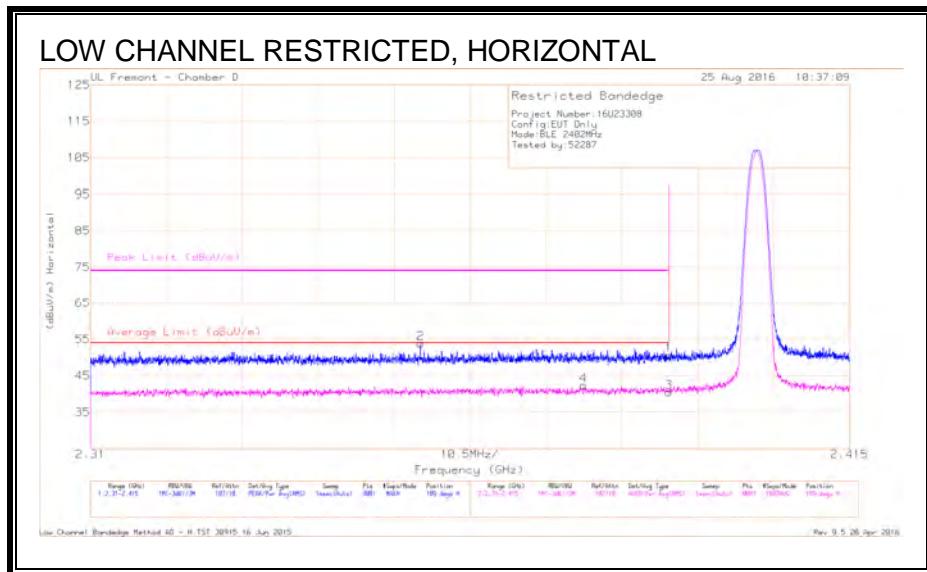
For harmonics and Spurious Emission", the setting is RBW/VBW = 1 MHz/30kHz for pre-test before the final testing

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 BANDEDGE



DATA

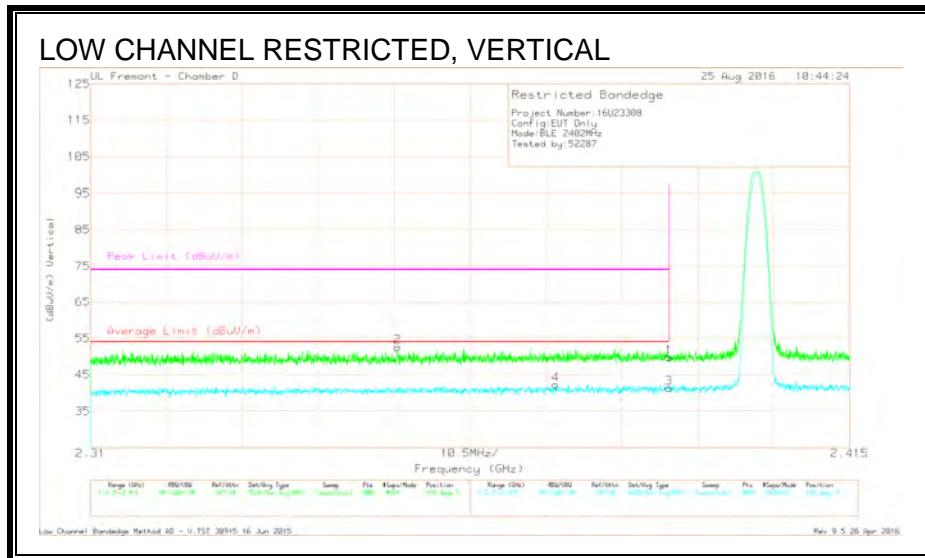
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (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	39.04	Pk	32.1	-20.6	50.54	-	-	74	-23.46	189	115	H
2	* 2.356	42.8	Pk	31.8	-20.7	53.9	-	-	74	-20.1	189	115	H
3	* 2.39	28.93	RMS	32.1	-20.6	40.43	54	-13.57	-	-	189	115	H
4	* 2.378	30.95	RMS	32	-20.6	42.35	54	-11.65	-	-	189	115	H

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

Pk - Peak detector

RMS - RMS detection



DATA

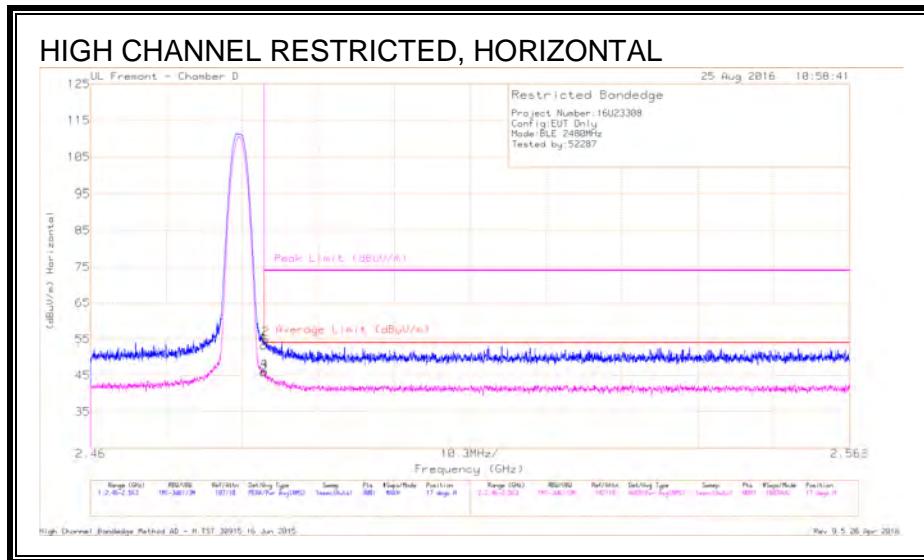
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (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
2	* 2.352	41.49	Pk	31.8	-20.7	52.59	-	-	74	-21.41	169	346	V
4	* 2.374	30.81	RMS	32	-20.6	42.21	54	-11.79	-	-	169	346	V
1	* 2.39	38.33	Pk	32.1	-20.6	49.83	-	-	74	-24.17	169	346	V
3	* 2.39	29.86	RMS	32.1	-20.6	41.36	54	-12.64	-	-	169	346	V

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

Pk - Peak detector

RMS - RMS detection



DATA

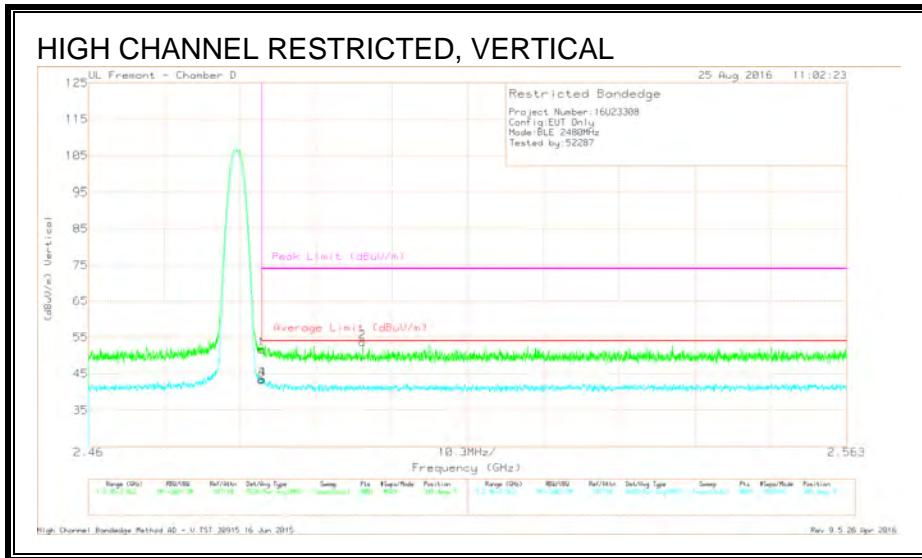
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (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	41.43	Pk	32.3	-20.5	53.23	-	-	74	-20.77	17	111	H
2	* 2.484	43.19	Pk	32.3	-20.5	54.99	-	-	74	-19.01	17	111	H
3	* 2.484	34.05	RMS	32.3	-20.5	45.85	54	-8.15	-	-	17	111	H
4	* 2.484	34.39	RMS	32.3	-20.5	46.19	54	-7.81	-	-	17	111	H

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

Pk - Peak detector

RMS - RMS detection



DATA

Trace Markers

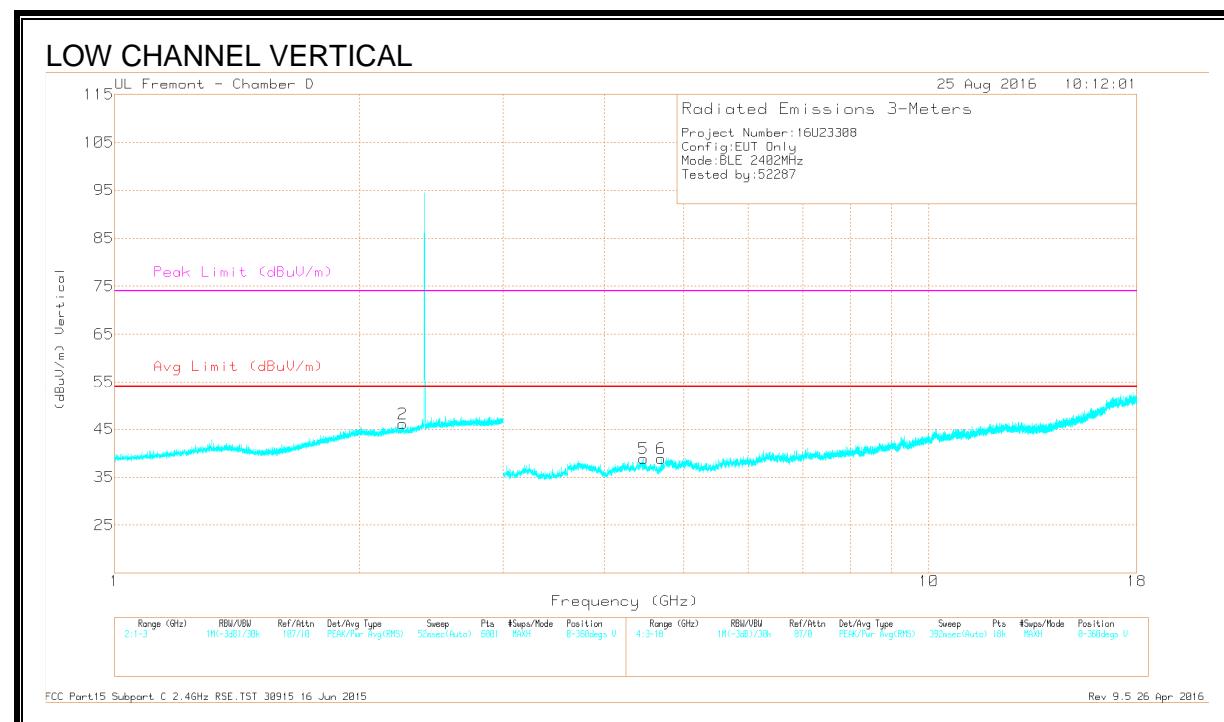
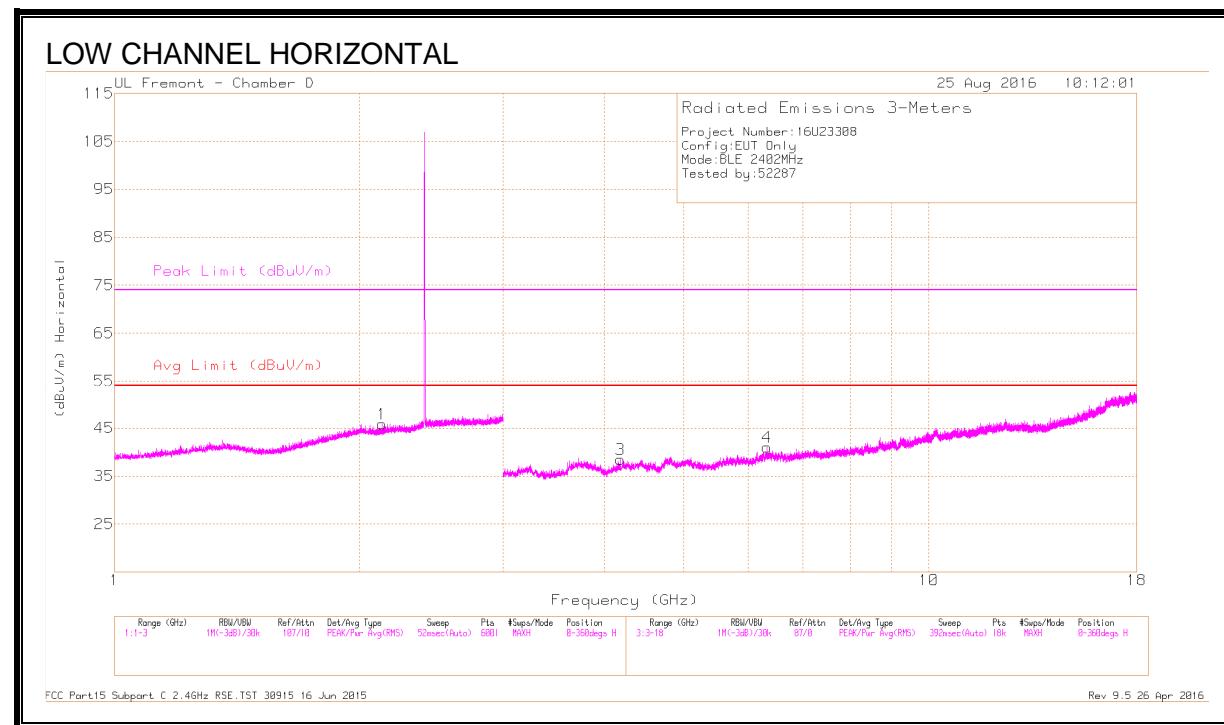
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	39.84	Pk	32.3	-20.5	51.64	-	-	74	-22.36	349	332	V
3	* 2.484	31.58	RMS	32.3	-20.5	43.38	54	-10.62	-	-	349	332	V
4	* 2.484	31.64	RMS	32.3	-20.5	43.44	54	-10.56	-	-	349	332	V
2	* 2.497	41.9	Pk	32.3	-20.5	53.7	-	-	74	-20.3	349	332	V

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

Pk - Peak detector

RMS - RMS detection

8.2.2. HARMONICS AND SPURIOUS EMISSIONS



DATA

Radiated Emissions

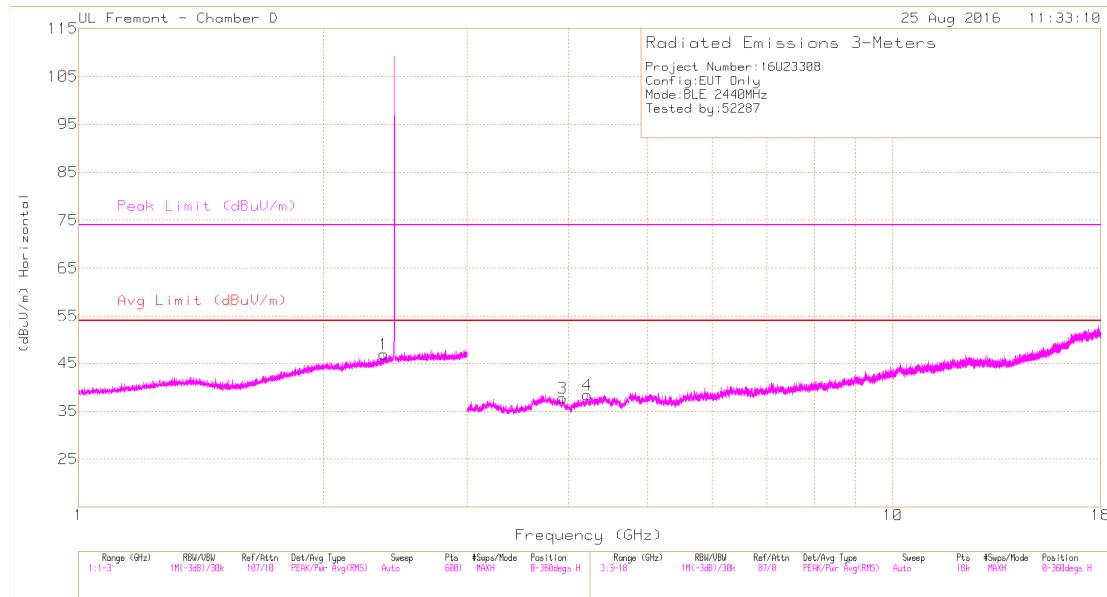
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/P ad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.258	41.96	PK2	31.5	-20.8	52.66	-	-	74	-21.34	333	144	V
	* 2.257	31.06	MAv1	31.5	-20.8	41.76	-	-	-	-	333	144	V
3	* 4.181	37.15	PK2	33.5	-27.8	42.85	-	-	74	-31.15	266	127	H
	* 4.183	27.17	MAv1	33.5	-27.8	32.87	-	-	-	-	266	127	H
6	* 4.694	37.51	PK2	34	-27.4	44.11	-	-	74	-29.89	310	100	V
	* 4.695	27.31	MAv1	34	-27.3	34.01	-	-	-	-	310	100	V
1	2.127	41.09	PK2	31.2	-20.9	51.39	-	-	-	-	357	154	H
	2.13	30.81	MAv1	31.2	-20.9	41.11	-	-	-	-	357	154	H
5	4.462	36.94	PK2	33.9	-27.4	43.44	-	-	-	-	310	105	V
	4.462	26.91	MAv1	33.9	-27.4	33.41	-	-	-	-	310	105	V
4	6.328	36.74	PK2	35.7	-25.7	46.74	-	-	-	-	314	143	H
	6.328	26.21	MAv1	35.7	-25.7	36.21	-	-	-	-	314	143	H

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

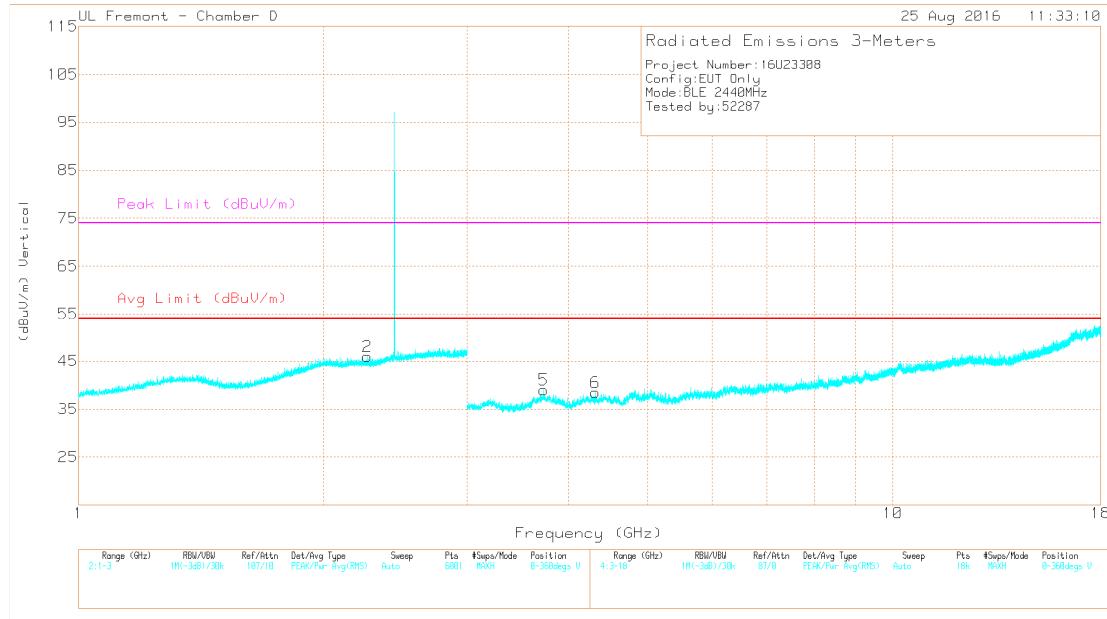
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



DATA

Radiated Emissions

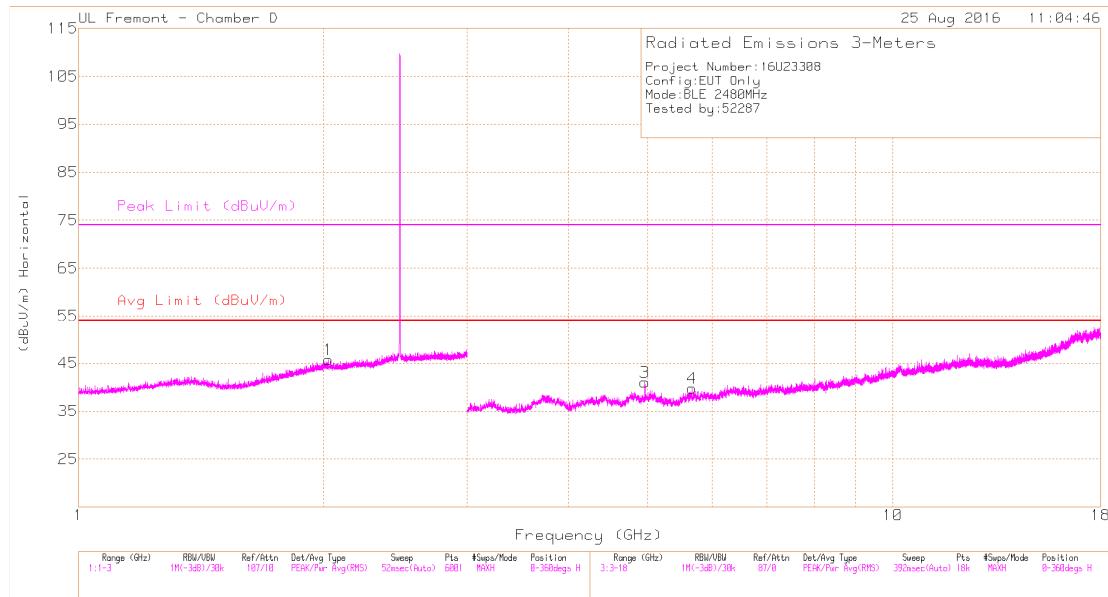
Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/P ad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
	* 2.371	41.92	PK2	32	-20.7	53.22	-	-	74	-20.78	120	107	H
1	* 2.368	30.75	MAv1	31.9	-20.7	41.95	-	-	-	-	120	107	H
2	* 2.265	42.67	PK2	31.5	-20.8	53.37	-	-	74	-20.63	221	144	V
	* 2.263	30.72	MAv1	31.5	-20.8	41.42	-	-	-	-	221	144	V
3	* 3.932	37.72	PK2	33.5	-27.9	43.32	-	-	74	-30.68	355	188	H
	* 3.932	27.97	MAv1	33.5	-27.9	33.57	-	-	-	-	355	188	H
	* 4.216	37.82	PK2	33.5	-27.3	44.02	-	-	74	-29.98	316	115	H
4	* 4.217	27.31	MAv1	33.5	-27.3	33.51	-	-	-	-	316	115	H
	* 3.727	39.15	PK2	33.5	-28.5	44.15	-	-	74	-29.85	227	240	V
5	* 3.729	28.29	MAv1	33.5	-28.5	33.29	-	-	-	-	227	240	V
	* 4.313	38.07	PK2	33.6	-28.3	43.37	-	-	74	-30.63	319	129	V
6	* 4.314	27.76	MAv1	33.6	-28.4	32.96	-	-	-	-	319	129	V

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

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

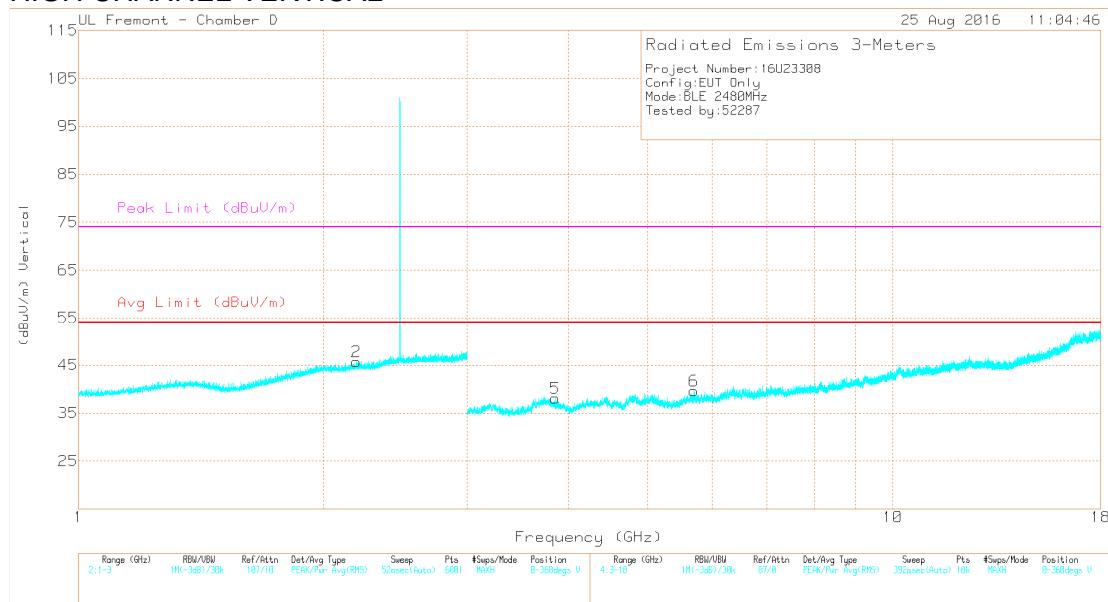
HIGH CHANNEL HORIZONTAL



FCC Part15 Subpart C 2.4GHz RSE.TST 30915 16 Jun 2015

Rev. 9.5 26 Apr 2016

HIGH CHANNEL VERTICAL



FCC Part15 Subpart C 2.4GHz RSE.TST 30915 16 Jun 2015

Rev. 9.5 26 Apr 2016

DATA

Radiated Emissions

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (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
	* 4.959	39.6	PK2	34.1	-27.5	46.2	-	-	74	-27.8	326	114	H
3	* 4.96	30.73	MAv1	34.1	-27.5	37.33	-	-	-	-	326	114	H
	* 3.849	38.36	PK2	33.5	-28.5	43.36	-	-	74	-30.64	315	120	V
5	* 3.853	28.15	MAv1	33.5	-28.5	33.15	-	-	-	-	315	120	V
	2.024	41.85	PK2	31.5	-21.1	52.25	-	-	-	-	280	101	H
1	2.025	30.89	MAv1	31.5	-21.1	41.29	-	-	-	-	280	101	H
	2.191	41.11	PK2	31.5	-20.8	51.81	-	-	-	-	334	127	V
2	2.193	30.82	MAv1	31.6	-20.8	41.62	-	-	-	-	334	127	V
	5.663	26.12	MAv1	34.7	-26.3	34.52	-	-	-	-	360	156	H
4	5.664	36.45	PK2	34.7	-26.3	44.85	-	-	-	-	360	156	H
6	5.702	36.81	PK2	34.8	-26.5	45.11	-	-	-	-	218	133	V
	5.702	26.67	MAv1	34.8	-26.5	34.97	-	-	-	-	218	133	V

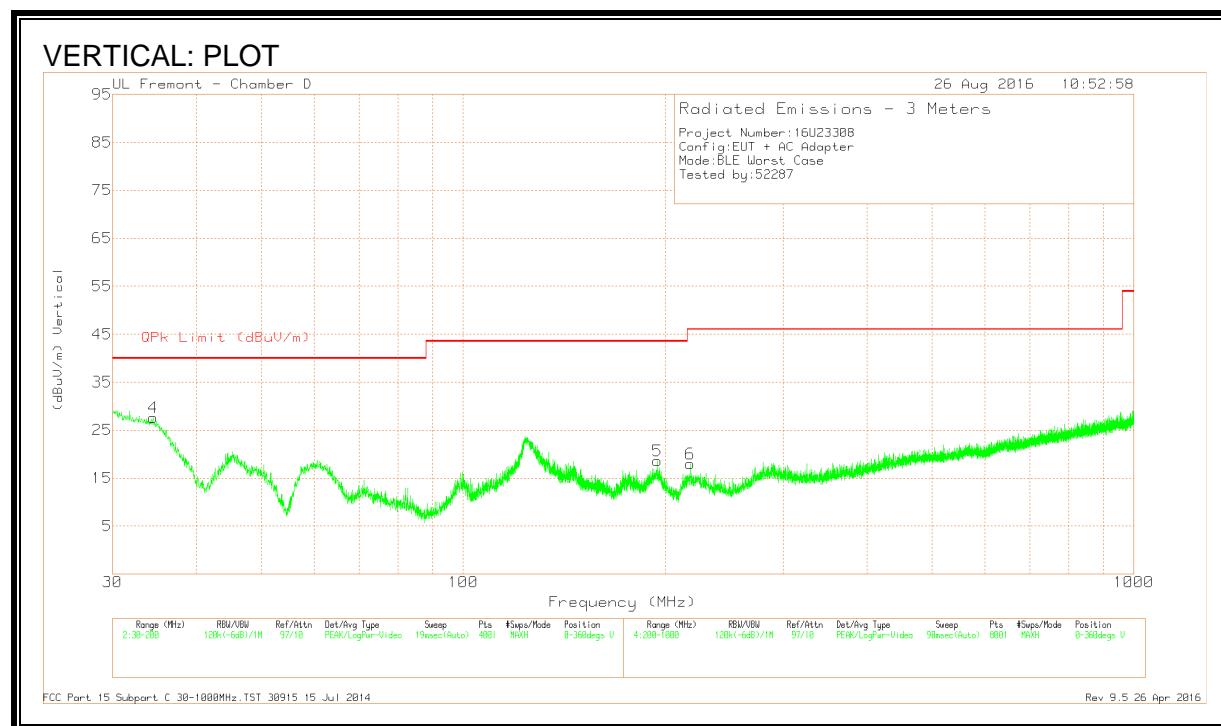
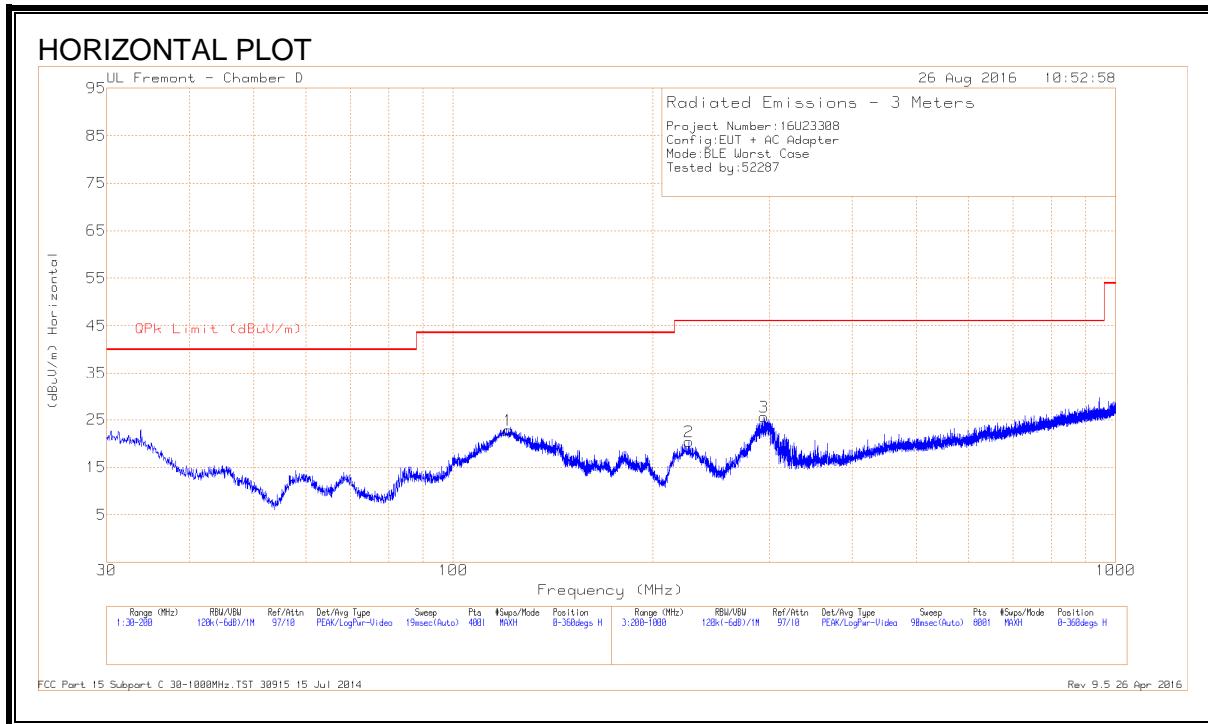
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

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	AF T408 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 121.1625	36.26	Pk	17.7	-31.2	22.76	43.52	-20.76	0-360	301	H
5	194.815	33.67	Pk	15.7	-30.8	18.57	43.52	-24.95	0-360	100	V
6	218	34.04	Pk	14.6	-30.7	17.94	46.02	-28.08	0-360	201	V
2	226.9	36.25	Pk	14.8	-30.7	20.35	46.02	-25.67	0-360	100	H
3	294.6	38.82	Pk	17.2	-30.4	25.62	46.02	-20.4	0-360	100	H
4	34.4625	37.47	Pk	22	-31.8	27.67	40	-12.33	0-360	100	V

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

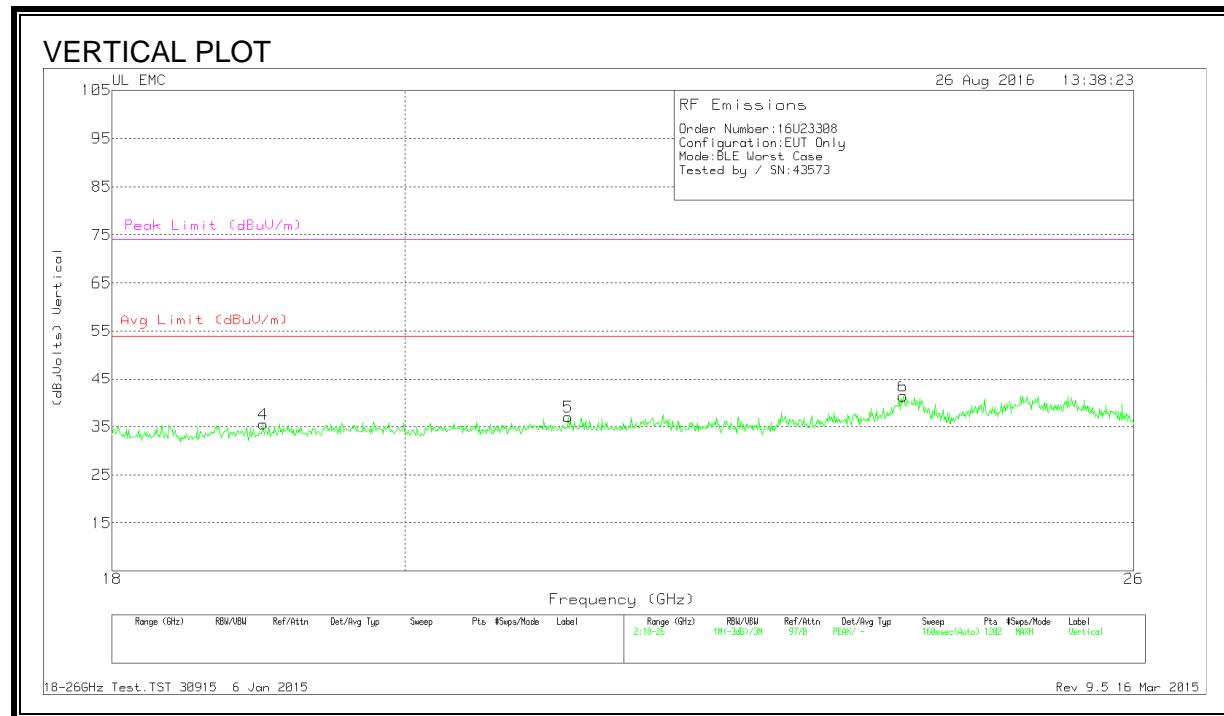
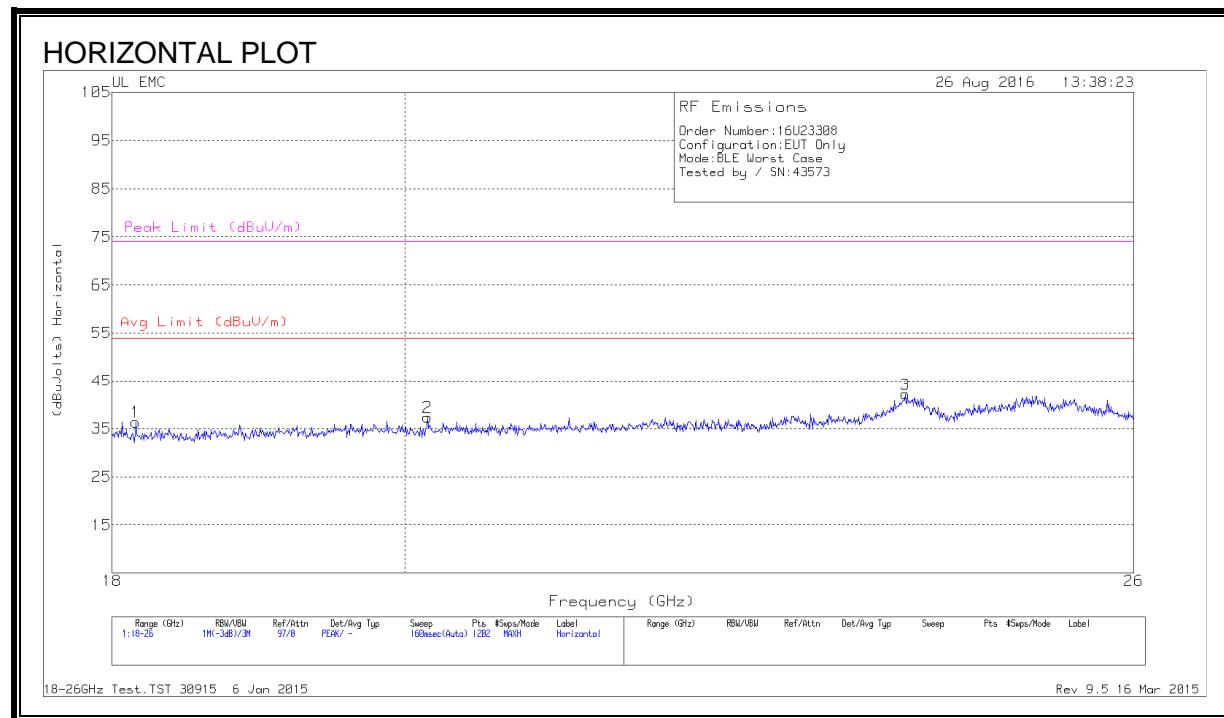
Pk - Peak detector

FCC Part 15 Subpart C 30-1000MHz.TST 30915 15 Jul 2014

Rev 9.5 26 Apr 2016

8.4. WORST-CASE 18 to 26 GHz

SPURIOUS EMISSIONS 18 to 26 GHz



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	18.153	39.03	Pk	32.4	-25.6	-9.5	36.33	54	-17.67	74	-37.67
2	20.165	39.23	Pk	32.7	-25.1	-9.5	37.33	54	-16.67	74	-36.67
3	23.948	41.97	Pk	34	-24.3	-9.5	42.17	54	-11.83	74	-31.83
4	19.006	37.2	Pk	32.6	-24.8	-9.5	35.5	54	-18.5	74	-38.5
5	21.211	38.1	Pk	33.1	-24.7	-9.5	37	54	-17	74	-37
6	23.928	40.83	Pk	34	-24	-9.5	41.33	54	-12.67	74	-32.67

Pk - Peak detector

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted Limit (dB μ 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 C63.10-2013

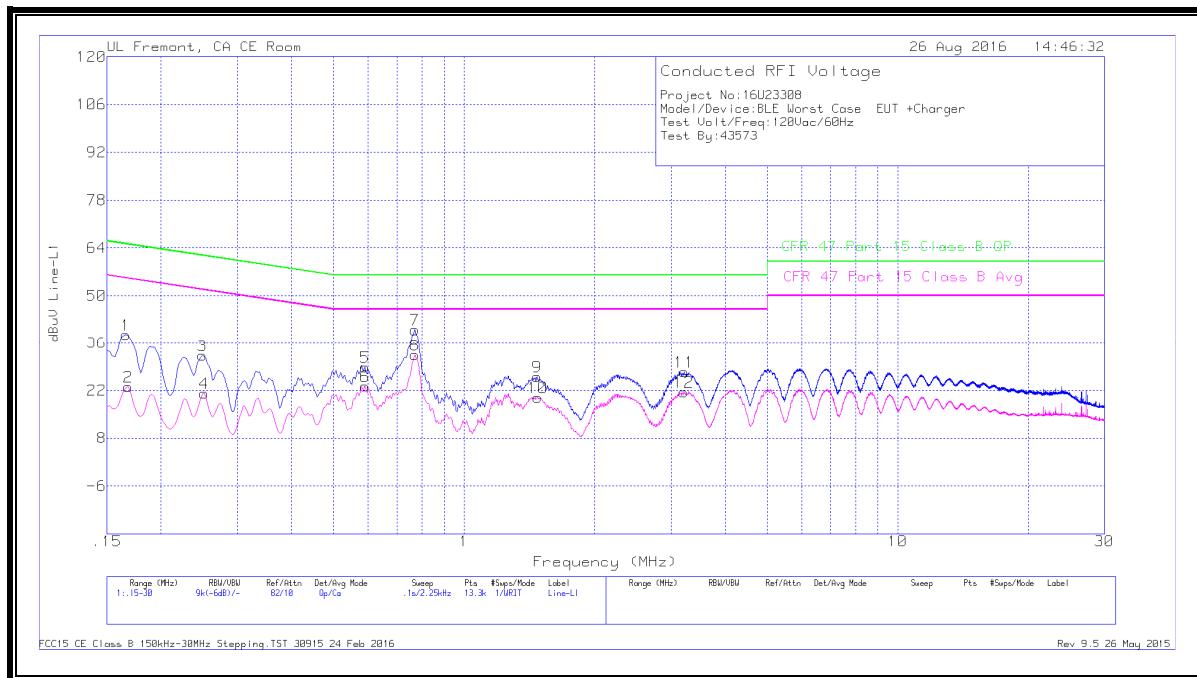
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

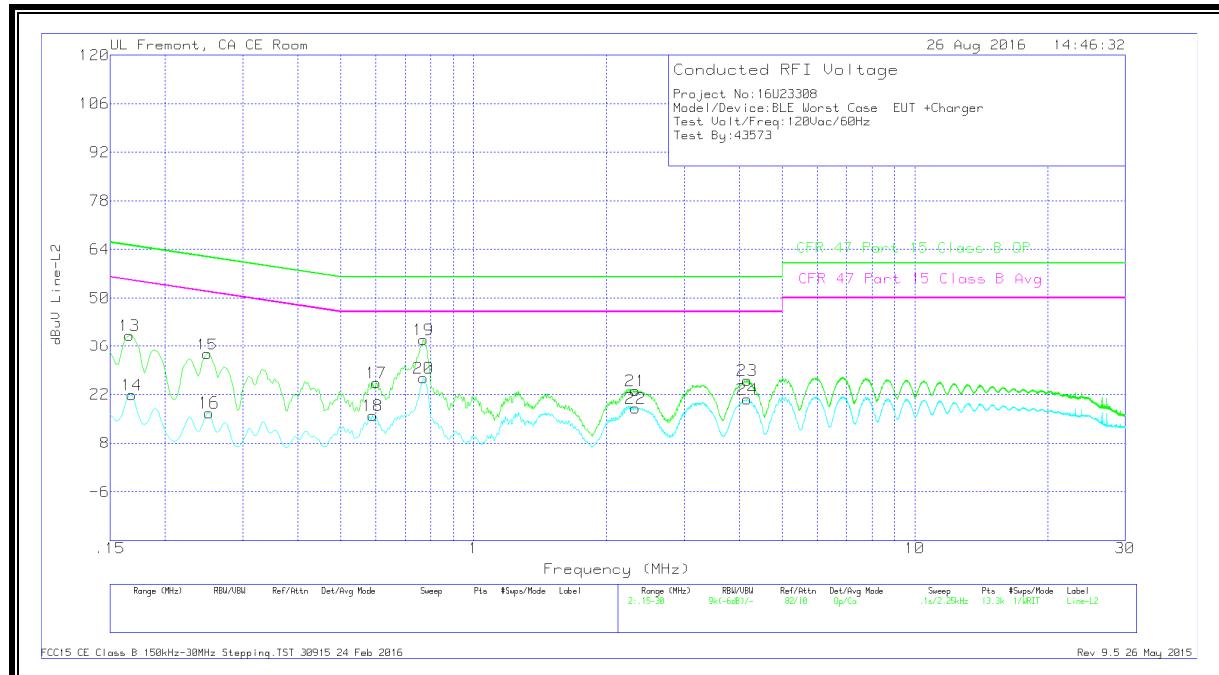
RESULTS

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

LINE 1 RESULTS



LINE 2 RESULTS



WORST EMISSIONS

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	.16575	28.4	Qp	0	0	10.1	38.5	65.17	-26.67	-	-
2	.168	12.89	Ca	0	0	10.1	22.99	-	-	55.06	-32.07
3	.249	22.09	Qp	0	0	10.1	32.19	61.79	-29.6	-	-
4	.25125	11	Ca	0	0	10.1	21.1	-	-	51.72	-30.62
5	.591	18.71	Qp	0	0	10.1	28.81	56	-27.19	-	-
6	.591	13.2	Ca	0	0	10.1	23.3	-	-	46	-22.7
7	.76875	29.91	Qp	0	0	10.1	40.01	56	-15.99	-	-
8	.76875	22.28	Ca	0	0	10.1	32.38	-	-	46	-13.62
9	1.473	15.82	Qp	0	.1	10.1	26.02	56	-29.98	-	-
10	1.4775	9.79	Ca	0	.1	10.1	19.99	-	-	46	-26.01
11	3.21675	17.28	Qp	0	.1	10.1	27.48	56	-28.52	-	-
12	3.20775	11.25	Ca	0	.1	10.1	21.45	-	-	46	-24.55

Qp - Quasi-Peak detector

Ca - CISPR average detection

Range 2: Line-L2 .15 - 30MHz

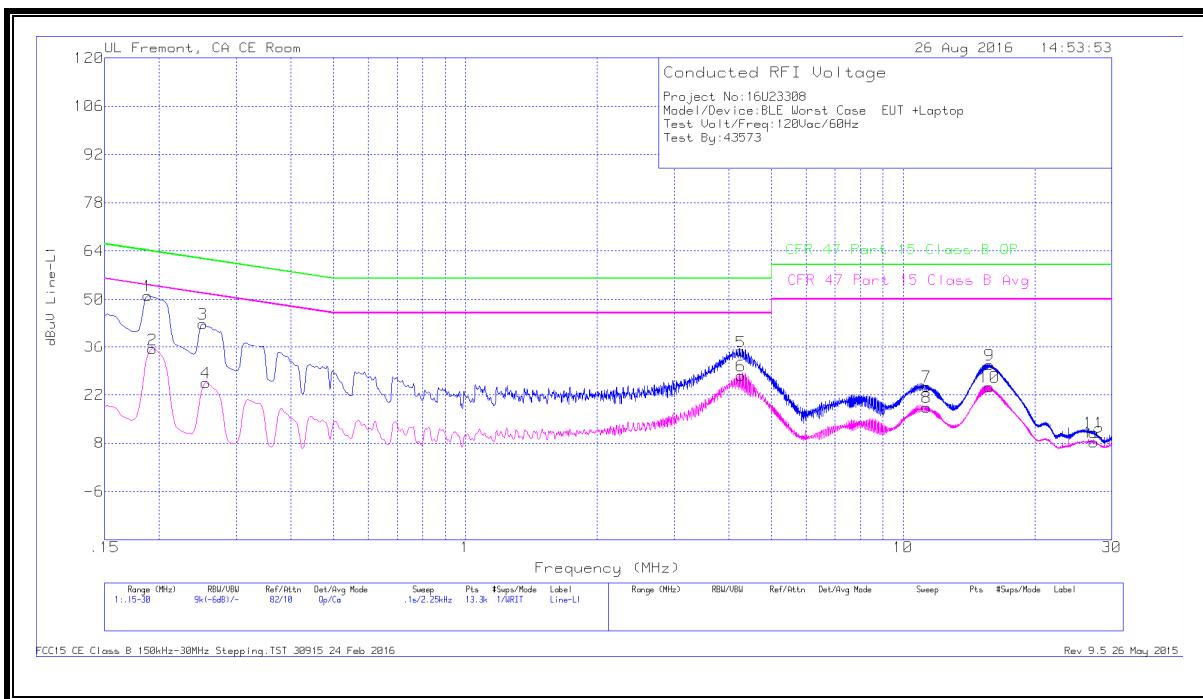
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables 2&3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
13	.16575	29.17	Qp	0	0	10.1	39.27	65.17	-25.9	-	-
14	.168	11.72	Ca	0	0	10.1	21.82	-	-	55.06	-33.24
15	.249	23.59	Qp	0	0	10.1	33.69	61.79	-28.1	-	-
16	.25125	6.61	Ca	0	0	10.1	16.71	-	-	51.72	-35.01
17	.60225	15.29	Qp	0	0	10.1	25.39	56	-30.61	-	-
18	.591	5.77	Ca	0	0	10.1	15.87	-	-	46	-30.13
19	.76875	27.87	Qp	0	0	10.1	37.97	56	-18.03	-	-
20	.76875	16.59	Ca	0	0	10.1	26.69	-	-	46	-19.31
21	2.32575	12.87	Qp	0	.1	10.1	23.07	56	-32.93	-	-
22	2.32463	7.85	Ca	0	.1	10.1	18.05	-	-	46	-27.95
23	4.164	15.89	Qp	0	.1	10.1	26.09	56	-29.91	-	-
24	4.17525	10.35	Ca	0	.1	10.1	20.55	-	-	46	-25.45

Qp - Quasi-Peak detector

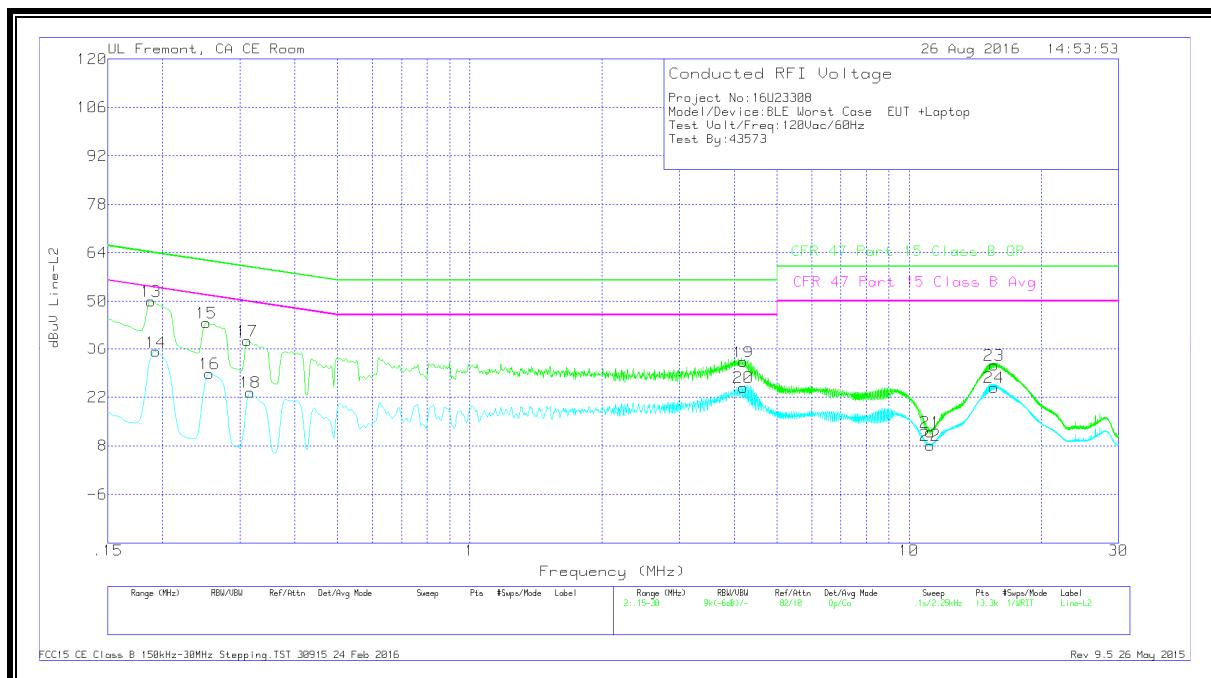
Ca - CISPR average detection

9.2. EUT POWERED BY HOST PC VIA USB CABLE

LINE 1 RESULTS



LINE 2 RESULTS



WORST EMISSIONS

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	.16575	28.87	Qp	0	0	10.1	38.97	65.17	-26.2	-	-
2	.168	13.07	Ca	0	0	10.1	23.17	-	-	55.06	-31.89
3	.249	22.08	Qp	0	0	10.1	32.18	61.79	-29.61	-	-
4	.25125	10.15	Ca	0	0	10.1	20.25	-	-	51.72	-31.47
5	.591	18.46	Qp	0	0	10.1	28.56	56	-27.44	-	-
6	.591	12.86	Ca	0	0	10.1	22.96	-	-	46	-23.04
7	.76875	29.84	Qp	0	0	10.1	39.94	56	-16.06	-	-
8	.771	22.39	Ca	0	0	10.1	32.49	-	-	46	-13.51
9	1.26825	16.31	Qp	0	.1	10.1	26.51	56	-29.49	-	-
10	1.26825	11.1	Ca	0	.1	10.1	21.3	-	-	46	-24.7
11	2.256	16.7	Qp	0	.1	10.1	26.9	56	-29.1	-	-
12	2.24925	11.06	Ca	0	.1	10.1	21.26	-	-	46	-24.74

Qp - Quasi-Peak detector

Ca - CISPR average detection

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	.16575	29.6	Qp	0	0	10.1	39.7	65.17	-25.47	-	-
14	.168	12.46	Ca	0	0	10.1	22.56	-	-	55.06	-32.5
15	.249	23.42	Qp	0	0	10.1	33.52	61.79	-28.27	-	-
16	.25125	6.36	Ca	0	0	10.1	16.46	-	-	51.72	-35.26
17	.33225	18.64	Qp	0	0	10.1	28.74	59.39	-30.65	-	-
18	.3345	2.88	Ca	0	0	10.1	12.98	-	-	49.34	-36.36
19	.75975	26.25	Qp	0	.1	10.1	36.45	56	-19.55	-	-
20	.762	13.91	Ca	0	0	10.1	24.01	-	-	46	-21.99
21	1.43475	11.15	Qp	0	.1	10.1	21.35	56	-34.65	-	-
22	1.43475	5.73	Ca	0	.1	10.1	15.93	-	-	46	-30.07
23	3.25725	13.96	Qp	0	.1	10.1	24.16	56	-31.84	-	-
24	3.2505	8.9	Ca	0	.1	10.1	19.1	-	-	46	-26.9

Qp - Quasi-Peak detector

Ca - CISPR average detection