



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

**BLUETOOTH LOW ENERGY  
CERTIFICATION TEST REPORT**

**FOR**

**TABLET DEVICE**

**MODEL NUMBER: A1652**

**FCC ID: BCGA1652  
IC: 579C-A1652**

**REPORT NUMBER: 14U19185-E7V3**

**ISSUE DATE: SEPTEMBER 10, 2015**

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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	09/03/2015	Initial Issue	M. Mekuria
V2	09/08/2015	Revised report to address TCB's questions	T. Chu
V3	09/10/2015	Updated antenna gain	J. Vang

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## 1. ATTESTATION OF TEST RESULTS

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

**EUT DESCRIPTION:** TABLET DEVICE

**MODEL:** A1652

**SERIAL NUMBER:** DLXQ100SGPD8 (Radiated); DLXPV00TGPD6 (Conducted)

**DATE TESTED:** JULY 19, 2015 - AUGUST 19, 2015

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

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For  
UL Verification Services Inc. By:



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CHIN PANG  
SENIOR ENGINEER  
UL VERIFICATION SERVICES INC.

Tested By:



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FRANCISCO GUARNERO  
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, 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 checked="" type="checkbox"/> Chamber D
<input type="checkbox"/> Chamber B	<input type="checkbox"/> Chamber E
<input type="checkbox"/> Chamber C	<input 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, 0.15 to 30 MHz	$\pm 3.52$ dB
Radiated Disturbance, 30 to 1000 MHz	$\pm 4.94$ dB
Radiated Disturbance, 1 to 6 GHz	$\pm 3.86$ dB
Radiated Disturbance, 6 to 18 GHz	$\pm 4.23$ dB
Radiated Disturbance, 18 to 26 GHz	$\pm 5.30$ dB
Radiated Disturbance, 26 to 40 GHz	$\pm 5.23$ dB

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a tablet with multimedia functions (music, application support, and video), Cellular GSM/GPRS/EGPRS/CDMA2000 1xRTT/1x Advanced/EVDO Rev.A/EVDO Rev.B /WCDMA /HSPA+/DC- HSDPA/LTE FDD & Carrier Aggregation/TDD/TD-SCDMA radio, IEEE 802.11a/b/g/n/ac radio, 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	8.93	7.82

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Gain
2.4	-0.60

### 5.4. SOFTWARE AND FIRMWARE

The software installed in the EUT during testing was 13B72.

## 5.5. WORST-CASE CONFIGURATION AND MODE

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

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

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

BLE: 1 Mbps.

For simultaneous transmission of multiple channels from the same antenna in BT/BLE and WLAN 5 GHz bands. Baseline testing was performed on various configurations to determine the worst case on radiated emissions.

The following configurations were investigated on AC line conducted test.

Configuration	Descriptions
1	EUT powered by AC/DC adapter via USB cable
2	EUT powered by host PC via USB cable

There are two vendors of the WiFi/Bluetooth radio modules: variant 1 and variant 2 and they have the same mechanical outline, same on board antenna, matching circuit, antenna structure and same specification. Baseline testing was performed on all two variants to determine the worst case on all conducted power and radiated emissions.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop AC/DC adapter	Lenovo	92P1160	11S92P1160Z1ZBGH798B12	N/A
Laptop	Lenovo	7659	L3-AL664 08/03	N/A
Earphone	Apple	N/A	N/A	N/A
EUT AC/CD adapter	Apple	A1385	D293062F3WVDHLHCF	N/A

### I/O CABLES (CONDUCTED TEST)

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

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Headphones Jack	1	3.5mm Audio	Shielded	0.9	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	Headphones Jack	1	3.5mm Audio	Shielded	0.9	N/A
2	AC	1	AC	Un-shielded	3	N/A

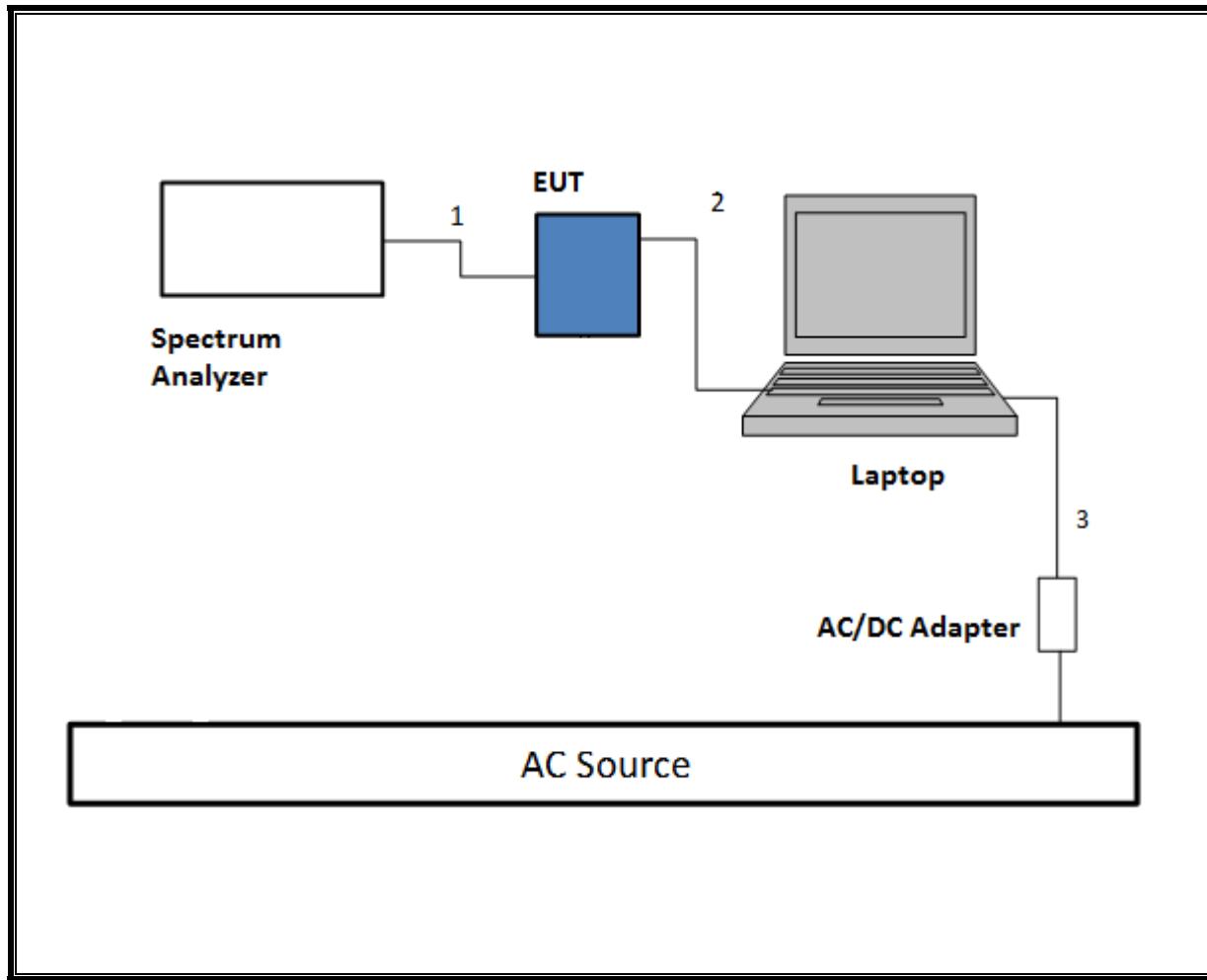
**I/O CABLES (AC LINE CONDUCTED: LAPTOP CONFIGUARTION)**

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Headphones Jack	1	3.5mm Audio	Shielded	0.9	N/A
2	USB	1	USB	Shielded	1	N/A
3	AC	1	AC	Un-shielded	3	N/A

**TEST SETUP - CONDUCTED TESTS**

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

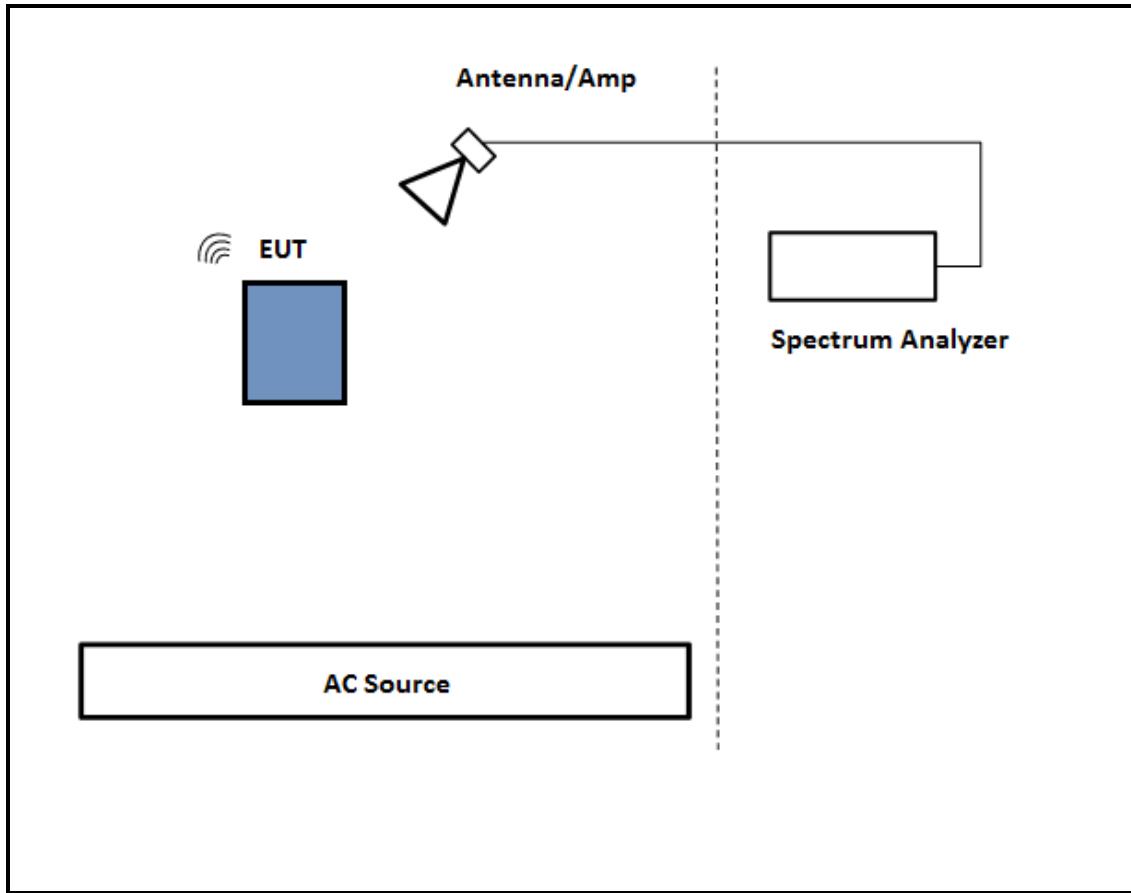
**SETUP DIAGRAM**



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

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

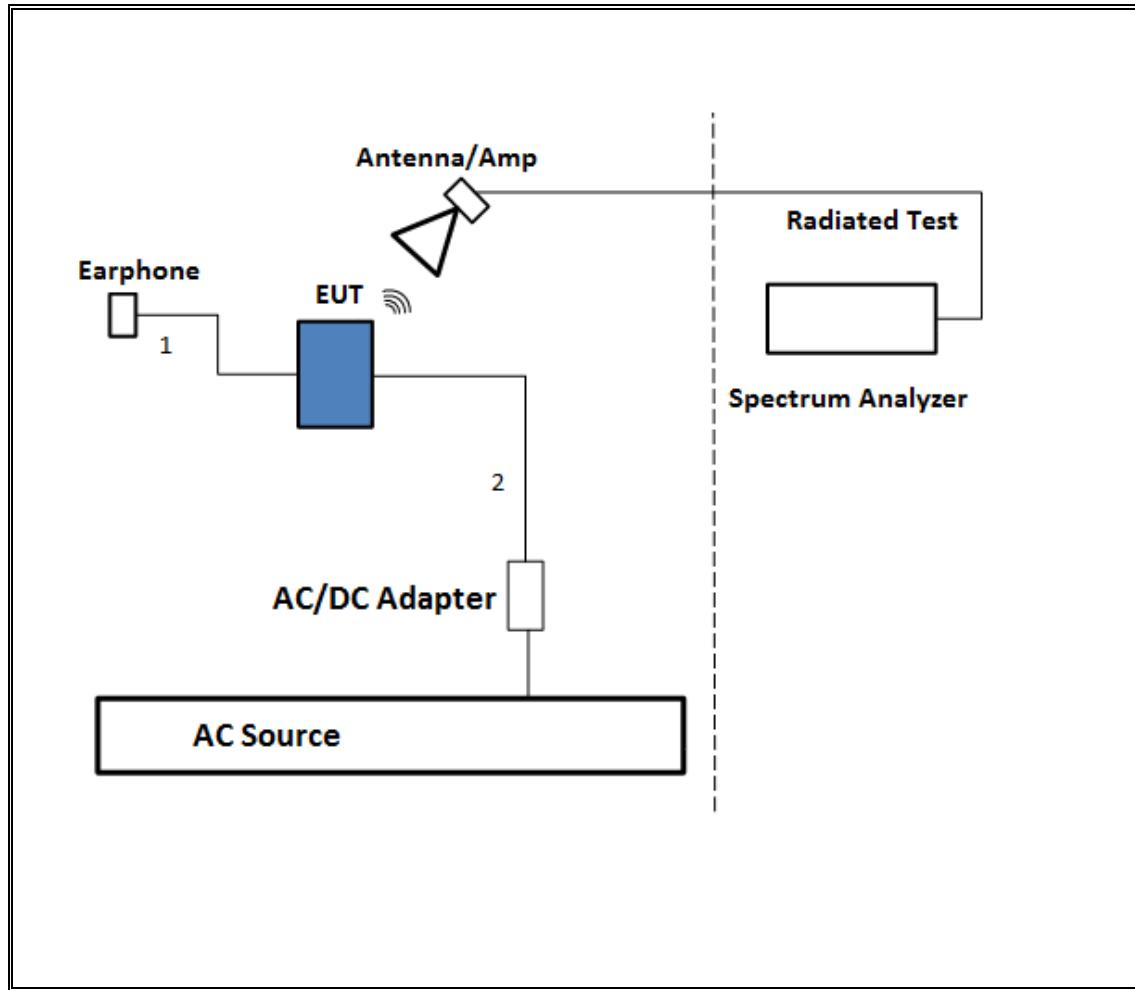
**SETUP DIAGRAM**



**TEST SETUP- BELOW 1GHz**

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

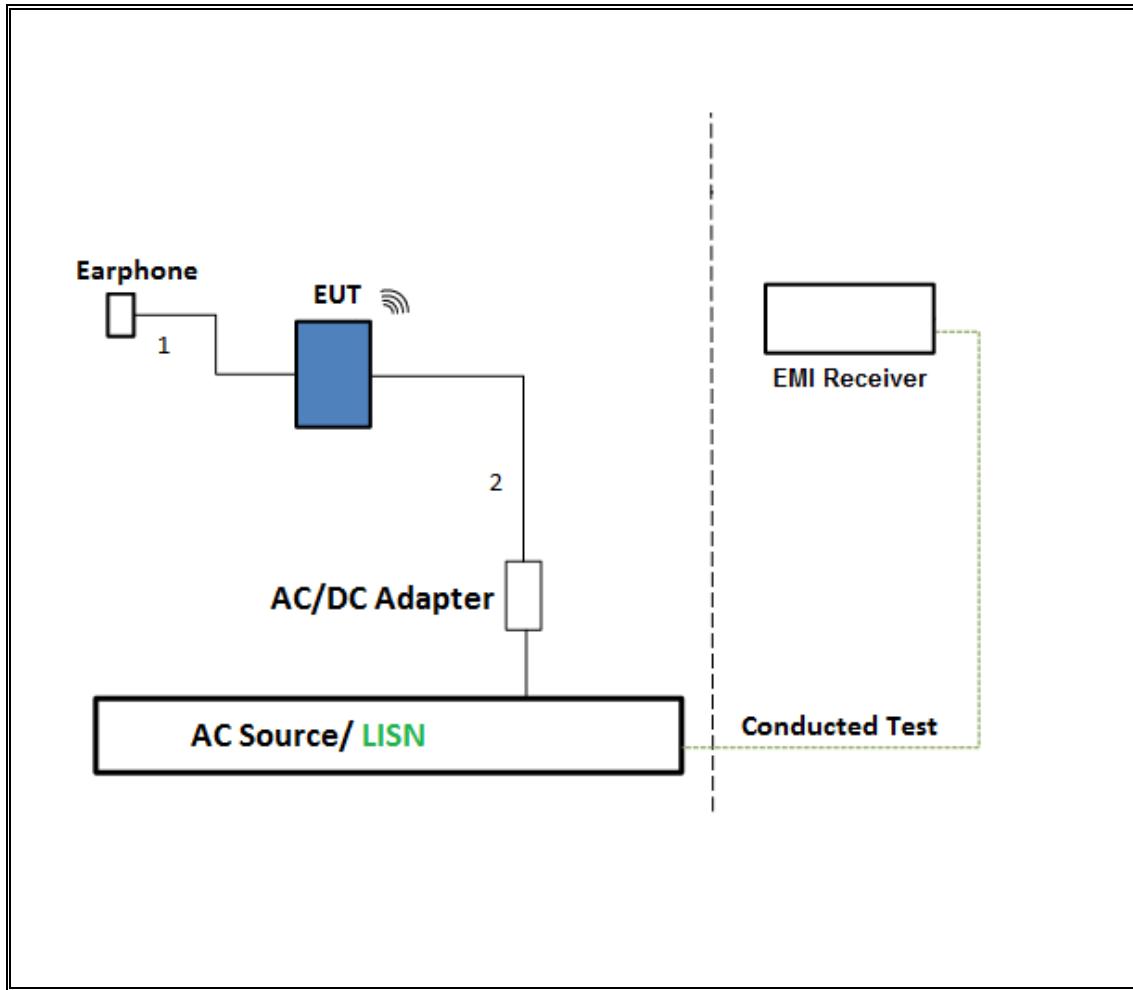
**SETUP DIAGRAM**



**TEST SETUP- AC LINE CONDUCTED: AC/DC ADAPTER**

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

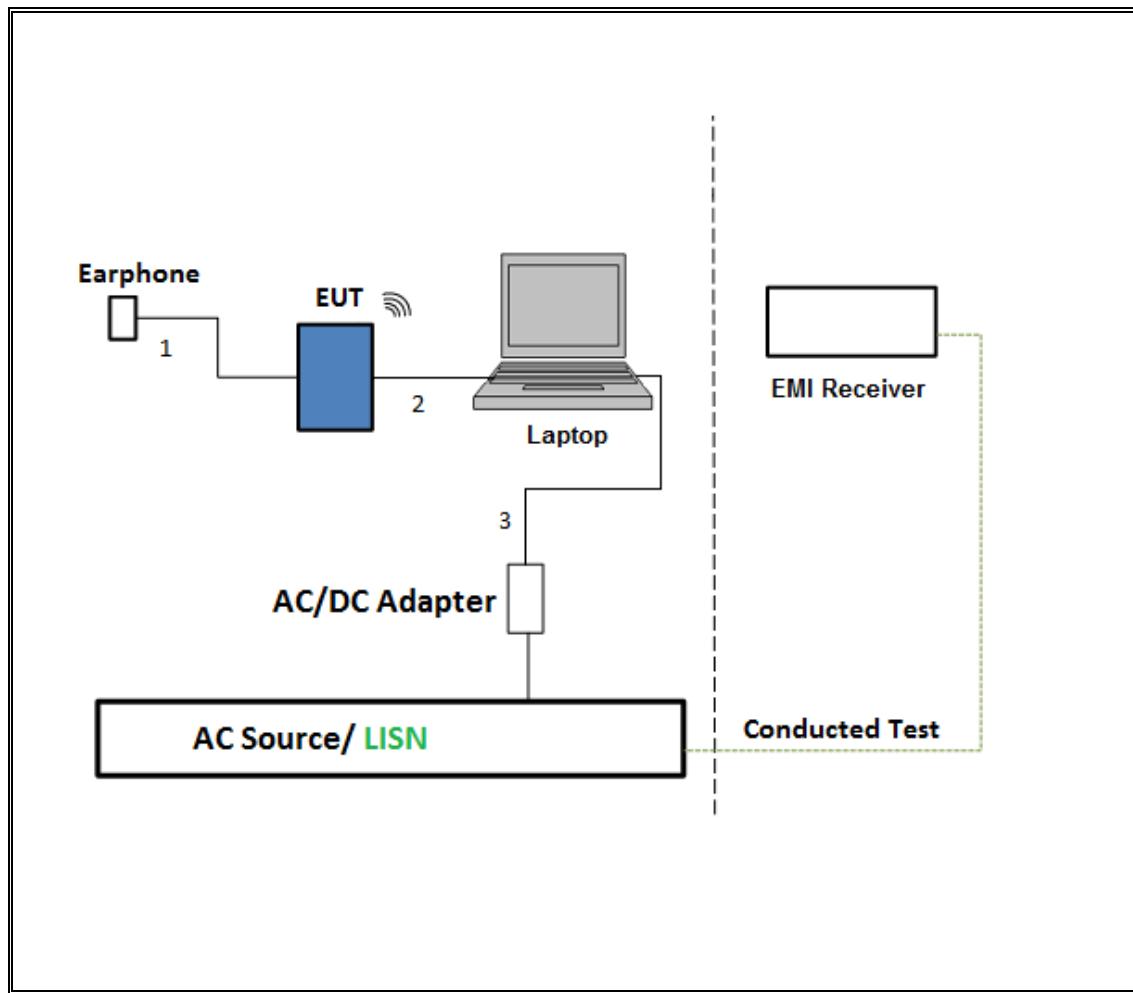
**SETUP DIAGRAM**



**TEST SETUP- AC LINE CONDUCTED: LAPTOP CONFIGURATION**

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

**SETUP DIAGRAM**



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	Manufacturer	Model	Cal Date	Cal Due
Antenna, Horn 1-18GHz	ETS Lindgren	3117	2/10/2015	2/10/2016
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	1/14/2015	1/14/2016
Amplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	1/16/20115	1/16/2016
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	5/7/2015	5/7/2016
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	6/1/2015	6/1/2016
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB1	2/13/2015	2/13/2016
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	2/20/2015	2/20/2016
Power Meter, P-series single channel	Agilent	N1911A	3/13/2015	3/13/2016
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Agilent	N1921A	3/6/2015	3/6/2016
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826	12/17/2014	12/17/2015
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Agilent	8449B	4/13/2015	4/13/2016
AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ECSI7	09/16/14	09/16/15
LISN for Conducted Emissions CISPR-16	FCC	50/250-25-2	01/16/15	01/16/16
Power Cable, Line Conducted Emissions ANSI 63.4	UL	PG1	7/28/2014	7/28/2015
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

#### **MEASUREMENT METHODS**

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

Output Power: KDB 558074 D01 v03r03, Section 9.1.2.

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

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

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

Band-edge: KDB 558074 D01 v03r03, Section 12.1

## 7.2. ON TIME, DUTY CYCLE

## LIMITS

None; for reporting purposes only.

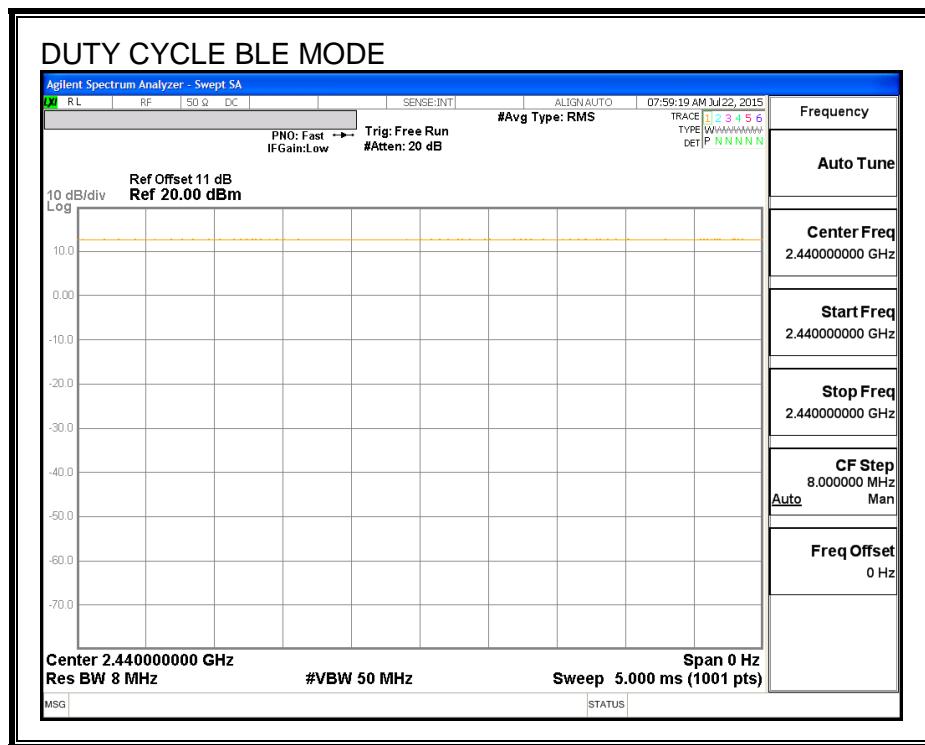
## PROCEDURE

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	5.000	5.000	1.000	100.00%	0.00	0.010

## DUTY CYCLE PLOTS



### 7.3. 6 dB BANDWIDTH

#### LIMITS

FCC §15.247 (a) (2)

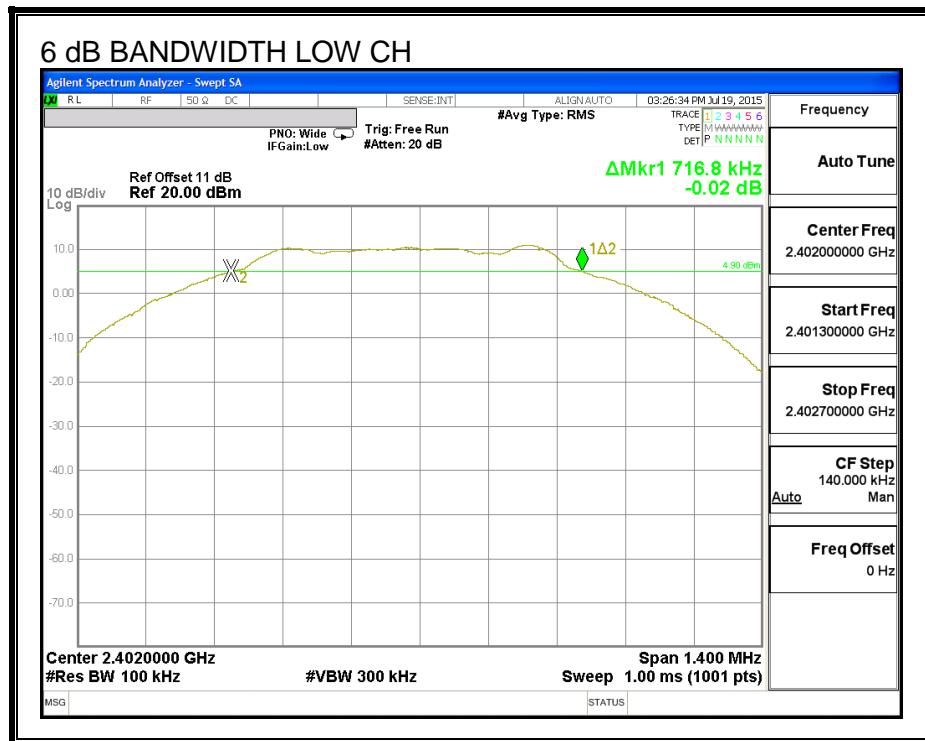
IC RSS-247 (5.2) (1)

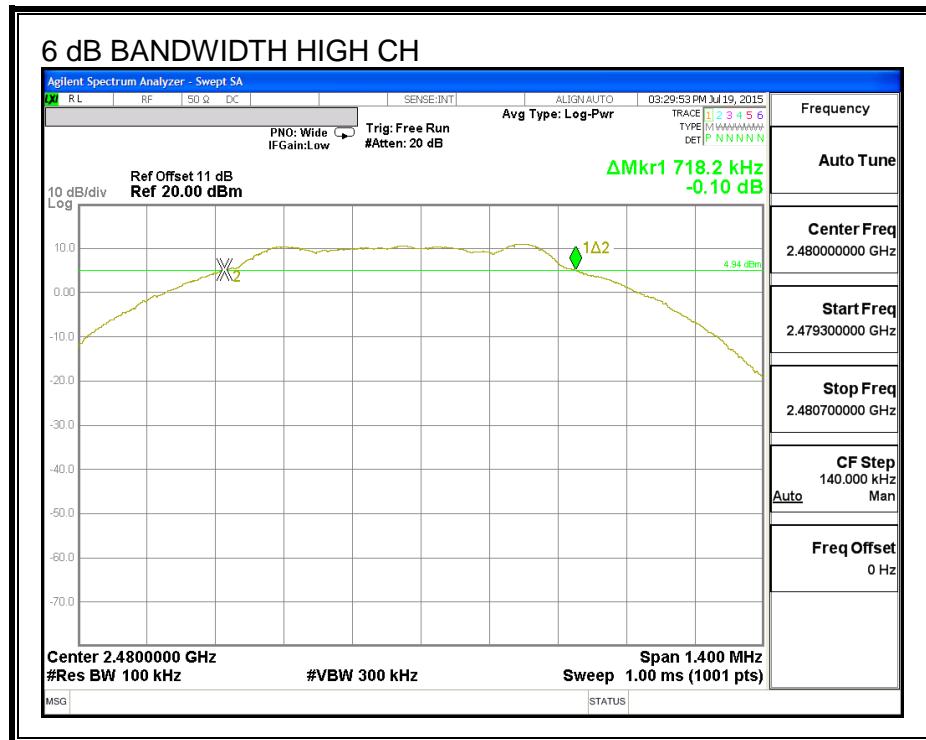
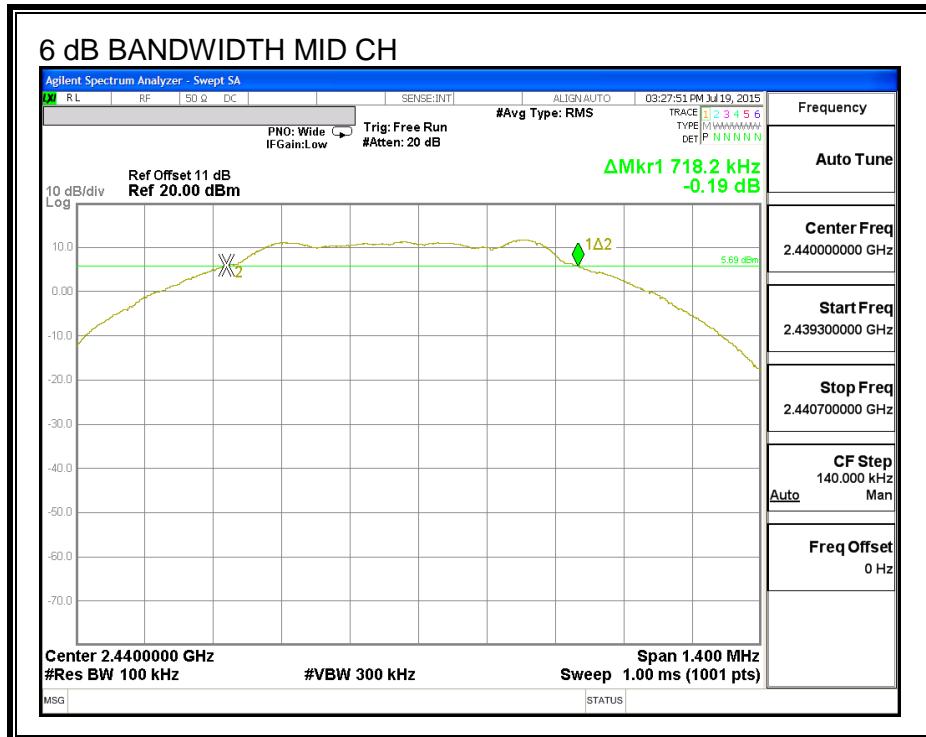
The minimum 6 dB bandwidth shall be at least 500 kHz.

#### RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.7168	0.5
Middle	2440	0.7182	0.5
High	2480	0.7182	0.5

#### 6 dB BANDWIDTH





## 7.4. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

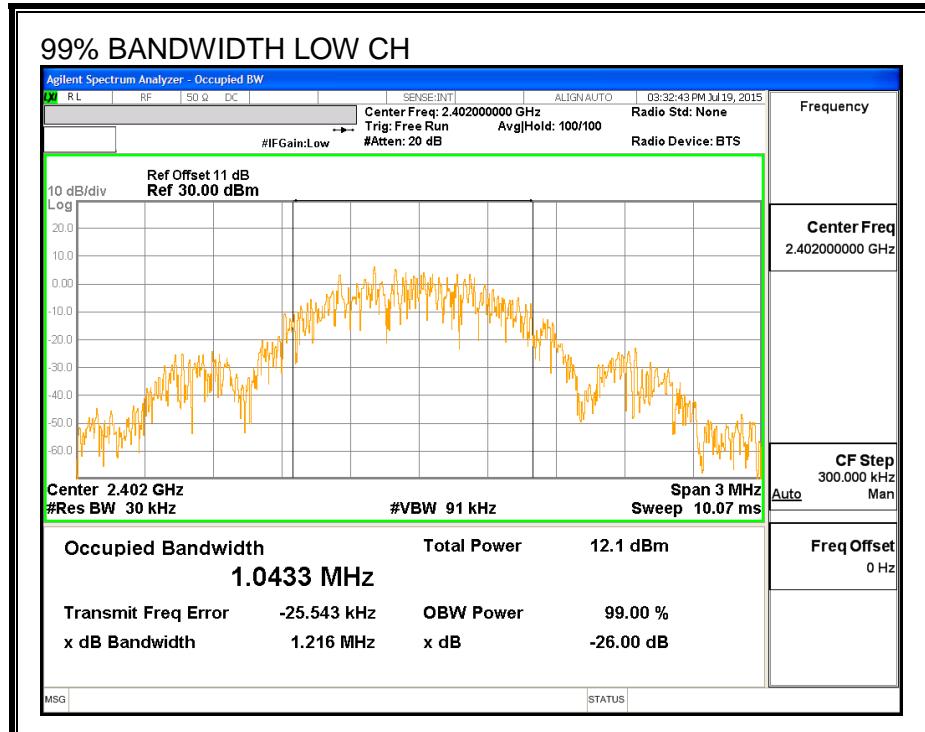
### TEST PROCEDURE

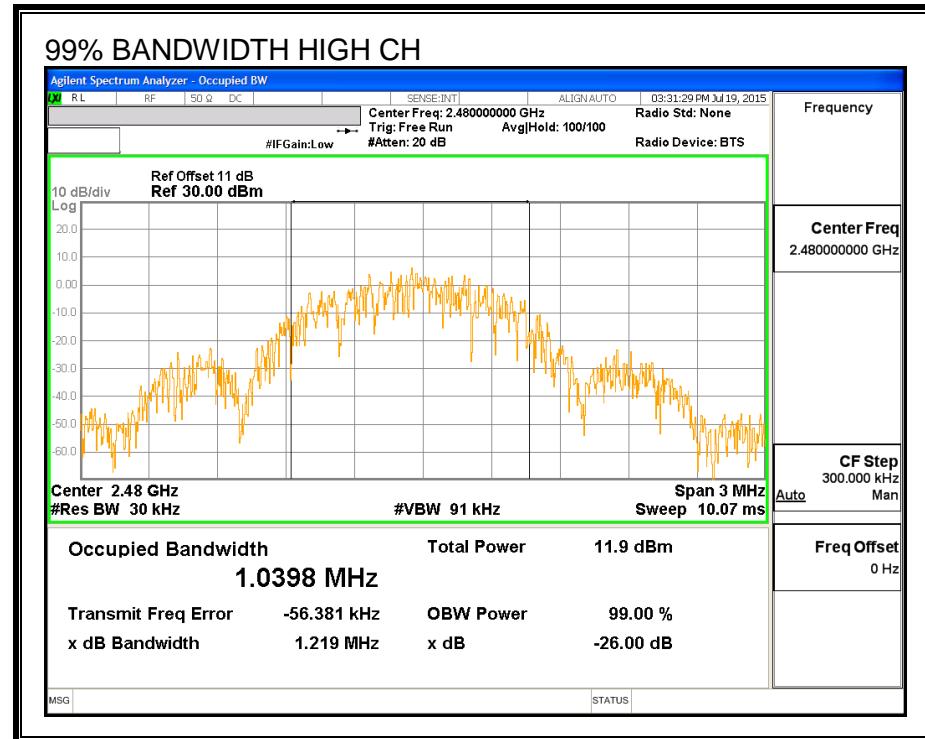
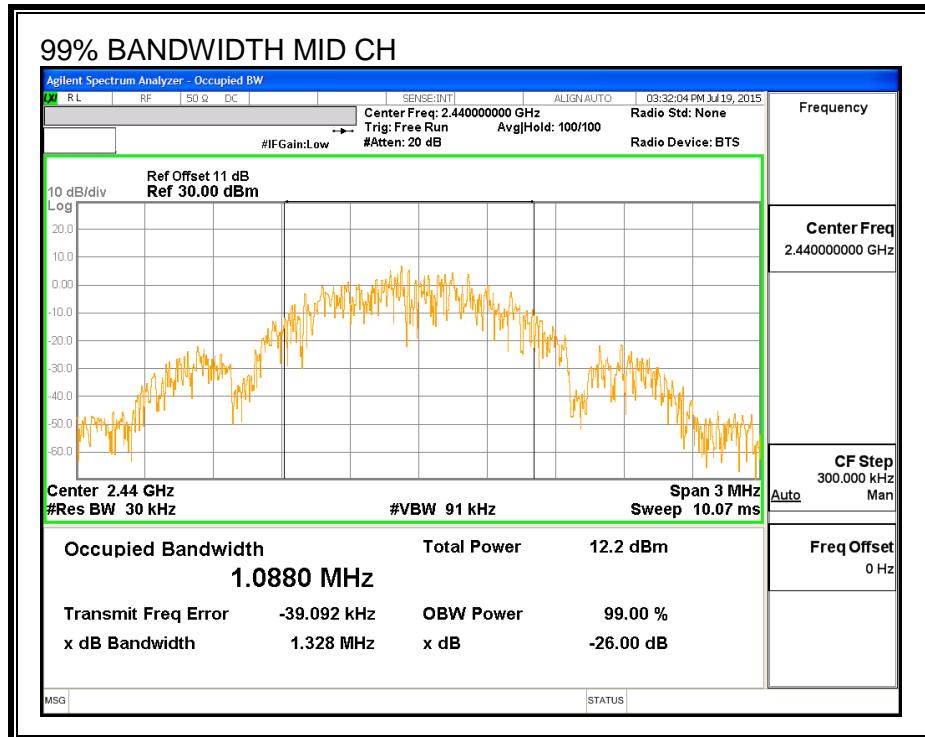
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0433
Middle	2440	1.0880
High	2480	1.0398

### 99% BANDWIDTH





## 7.5. AVERAGE POWER

### LIMITS

None; for reporting purposes only.

### RESULTS

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

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	8.70
Middle	2440	8.62
High	2480	8.49

## 7.6. OUTPUT POWER

### LIMITS

FCC §15.247 (b)

IC RSS-247 (5.4) (4)

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

### RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.93	30	-21.07
Middle	2440	8.86	30	-21.14
High	2480	8.68	30	-21.32

## 7.7. POWER SPECTRAL DENSITY

### LIMITS

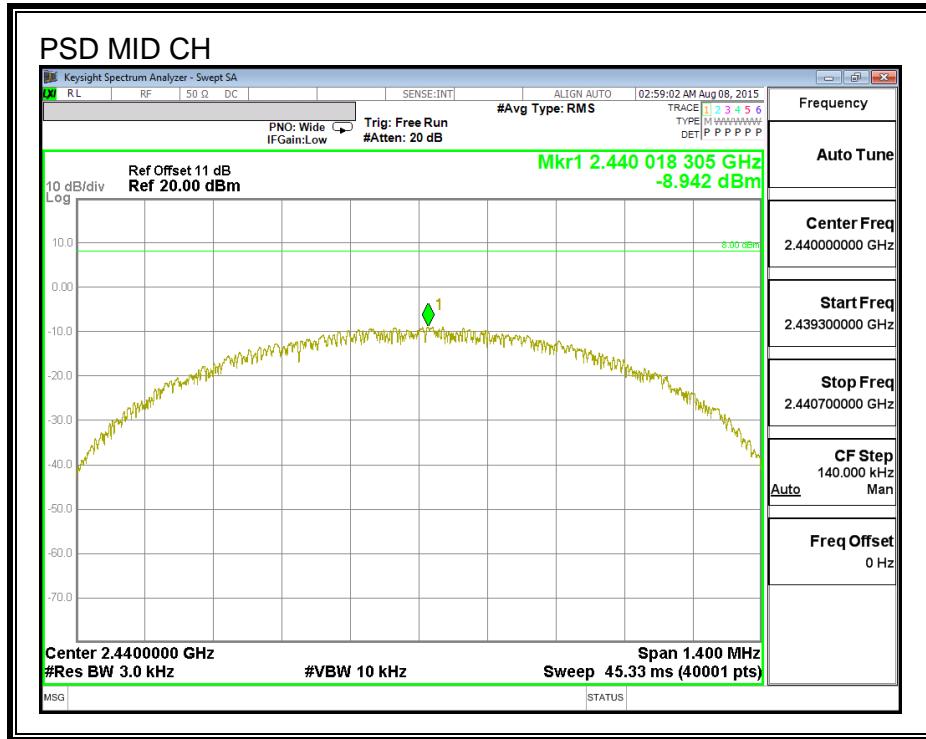
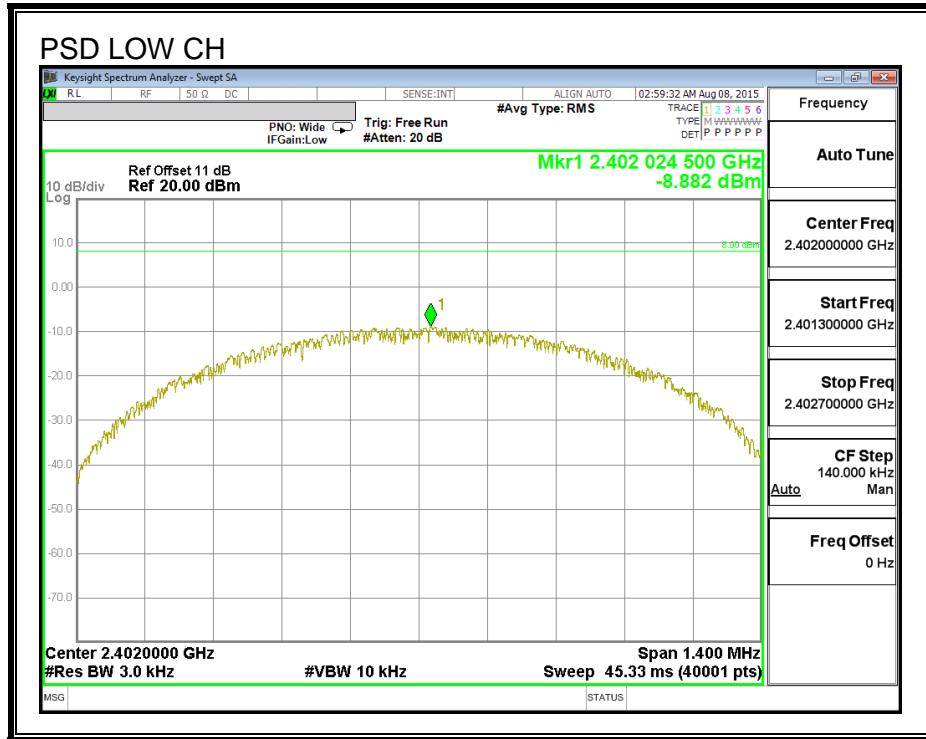
FCC §15.247 (e)

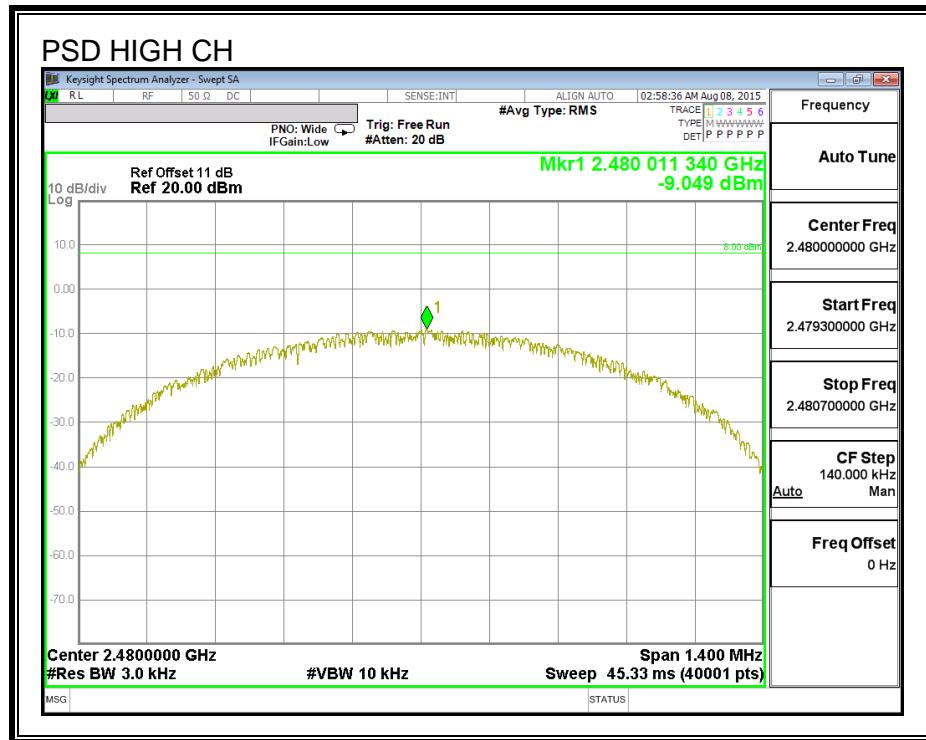
IC RSS-247 (5.2) (2)

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

### RESULTS

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-8.88	8	-16.88
Middle	2440	-8.94	8	-16.94
High	2480	-9.04	8	-17.04

**POWER SPECTRAL DENSITY**



## 7.8. CONDUCTED SPURIOUS EMISSIONS

### LIMITS

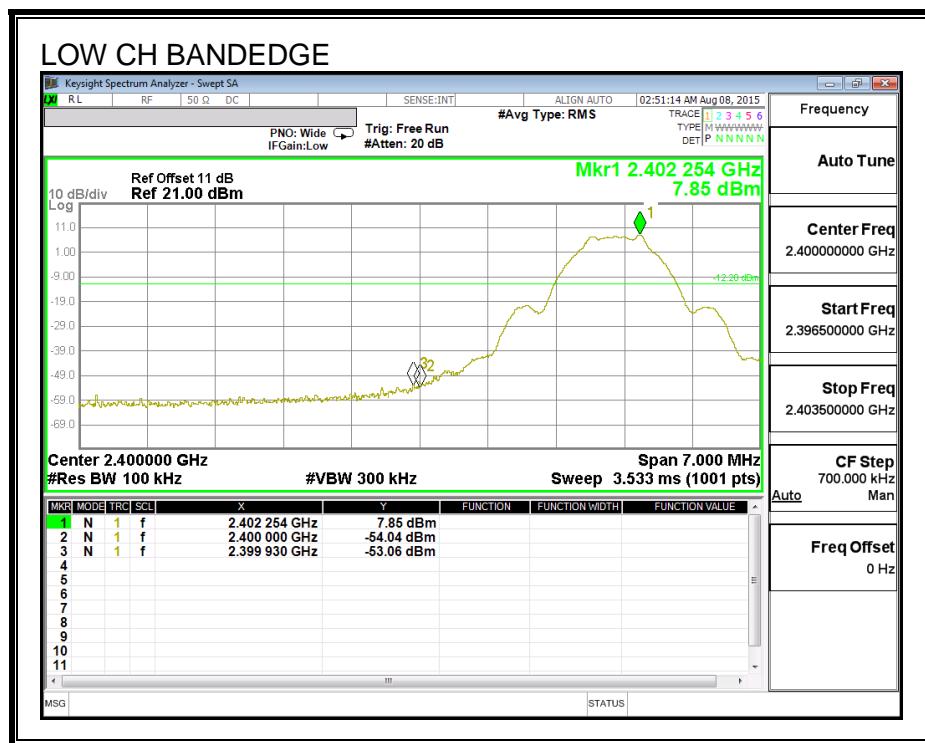
FCC §15.247 (d)

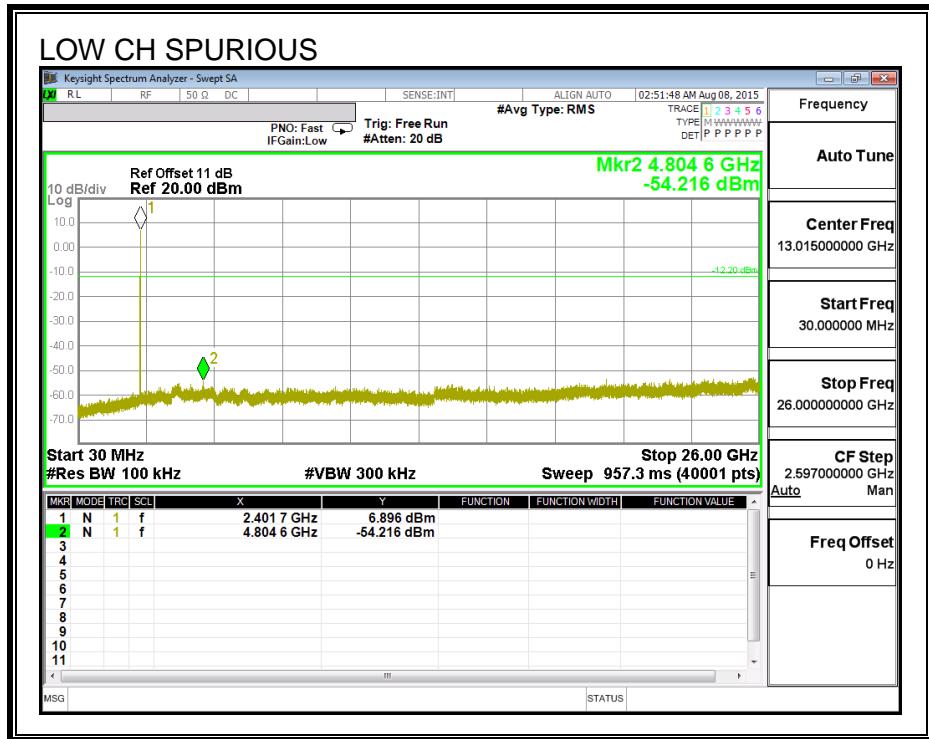
IC RSS-247 (5.5)

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

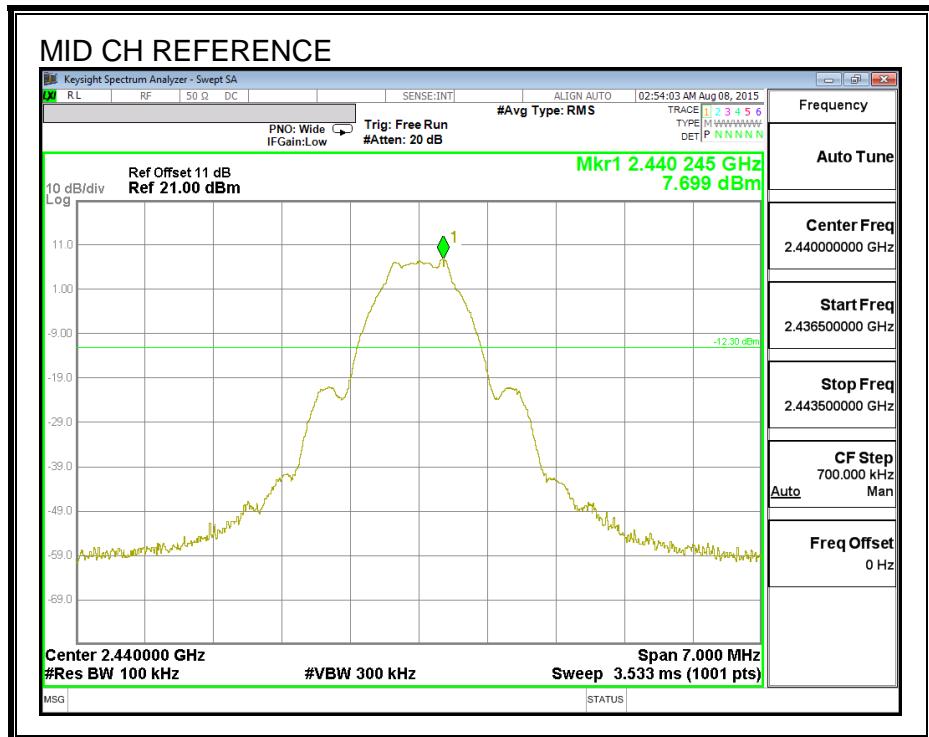
### RESULTS

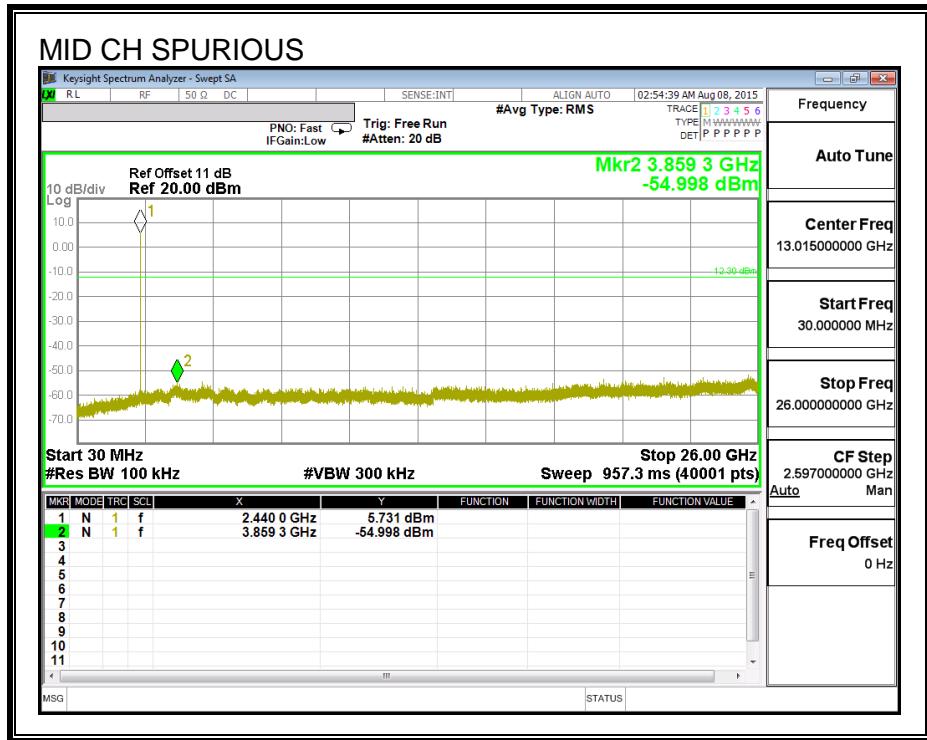
#### SPURIOUS EMISSIONS, LOW CHANNEL



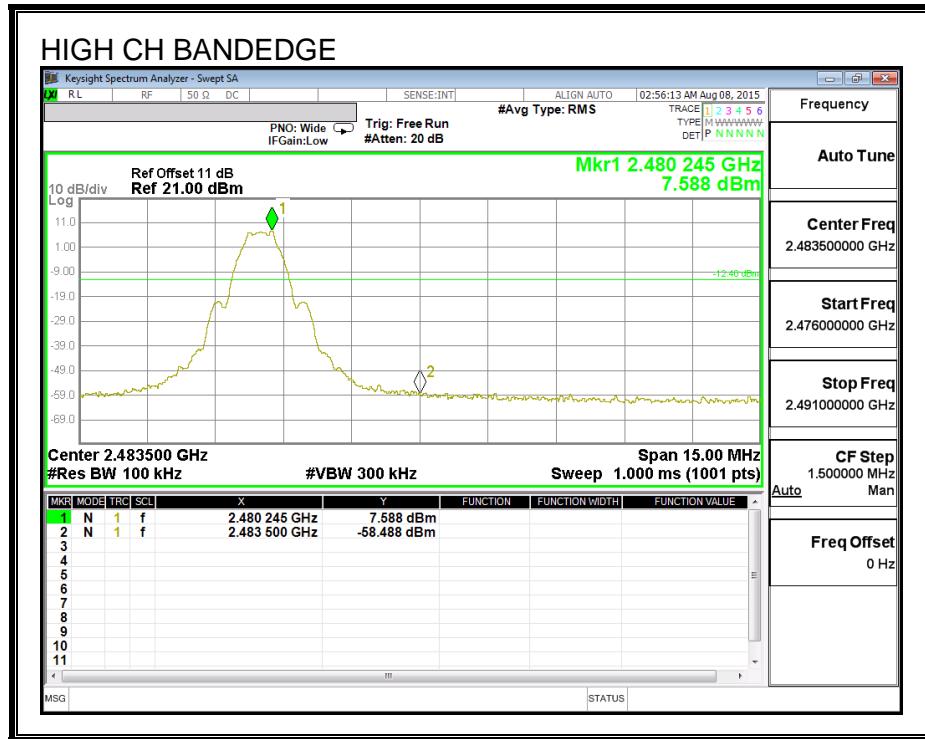


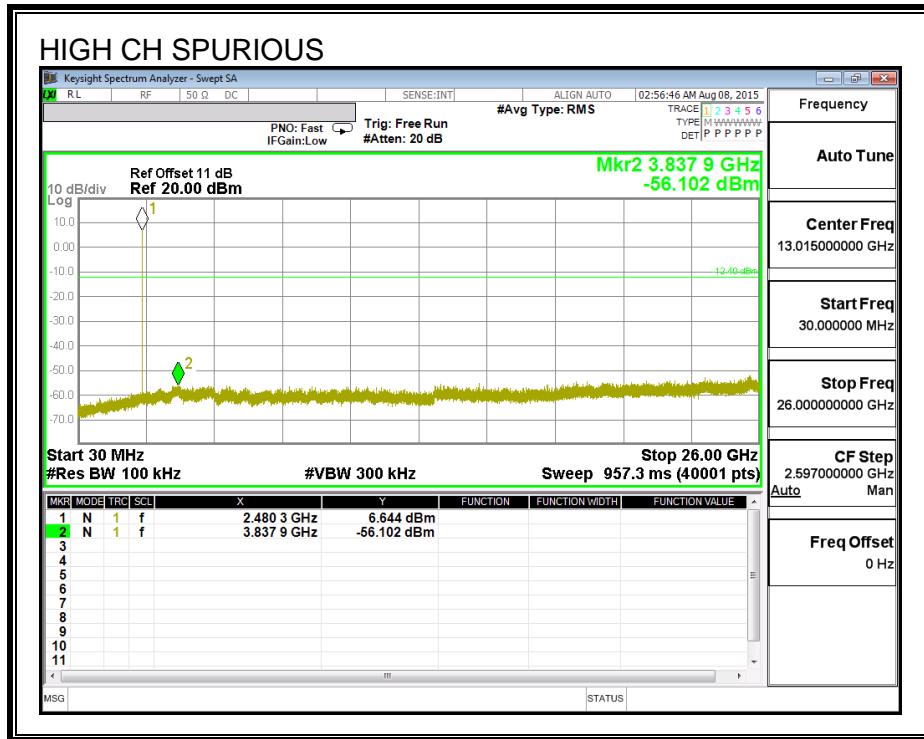
### SPURIOUS EMISSIONS, MID CHANNEL





### 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.

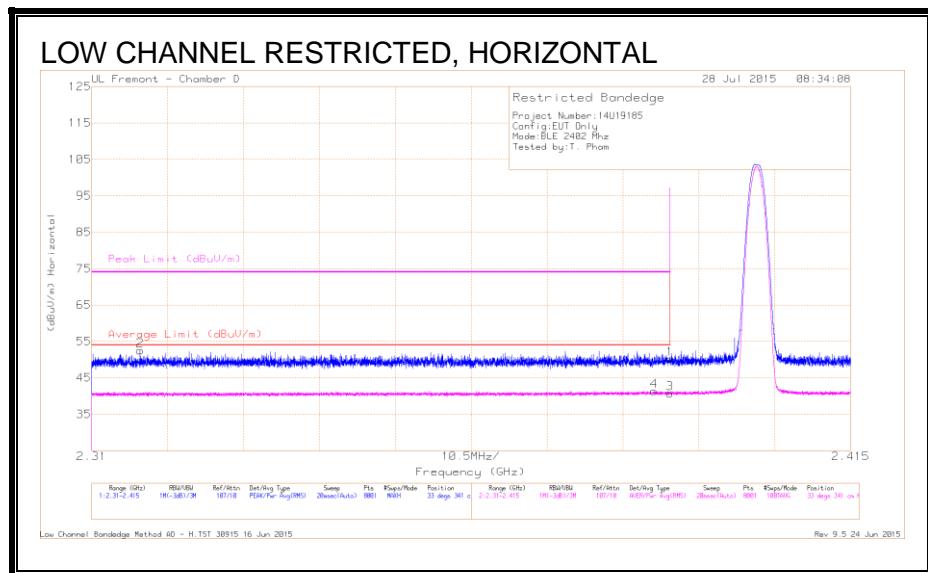
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 3MHz video bandwidth with average detector for average measurements.

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

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

## 8.2. TRANSMITTER ABOVE 1 GHz

### 8.2.1. RESTRICTED BANDEDGE



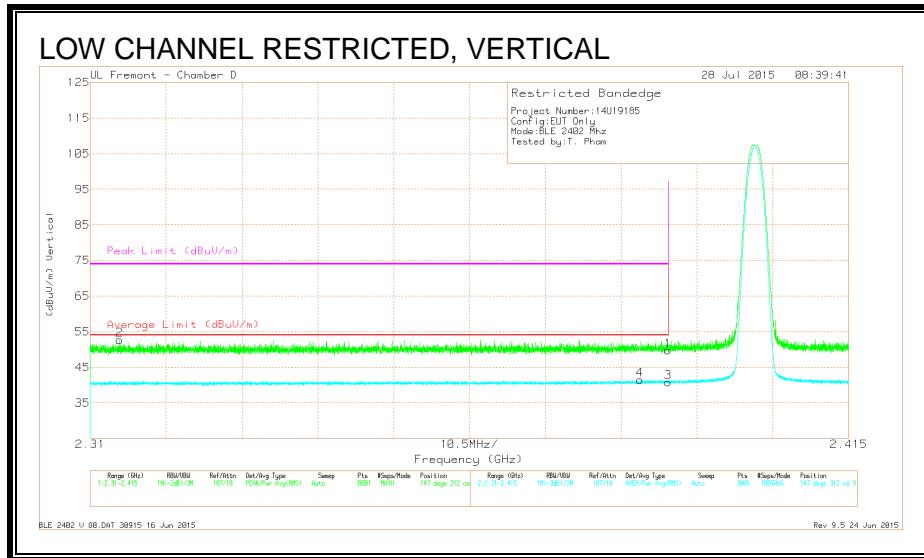
## DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.8	Pk	32.1	-20.7	50.2	-	-	74	-23.8	33	341	H
2	* 2.317	41.49	Pk	32	-21	52.49	-	-	74	-21.51	33	341	H
3	* 2.39	29.31	RMS	32.1	-20.7	40.71	54	-13.29	-	-	33	341	H
4	* 2.388	30.08	RMS	32.1	-20.8	41.38	54	-12.62	-	-	33	341	H

\* - indicates frequency in CFR15.205/IC8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection



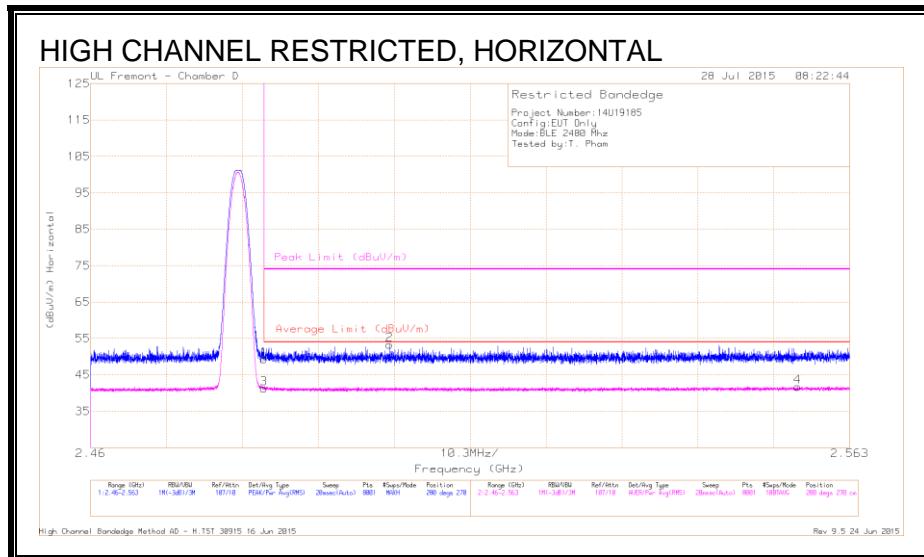
## DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.36	Pk	32.1	-20.7	49.76	-	-	74	-24.24	147	312	V
2	* 2.314	41.69	Pk	32	-21	52.69	-	-	74	-21.31	147	312	V
3	* 2.39	29.38	RMS	32.1	-20.7	40.78	54	-13.22	-	-	147	312	V
4	* 2.386	30.14	RMS	32.1	-20.8	41.44	54	-12.56	-	-	147	312	V

\* - indicates frequency in CFR15.205/IC8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection



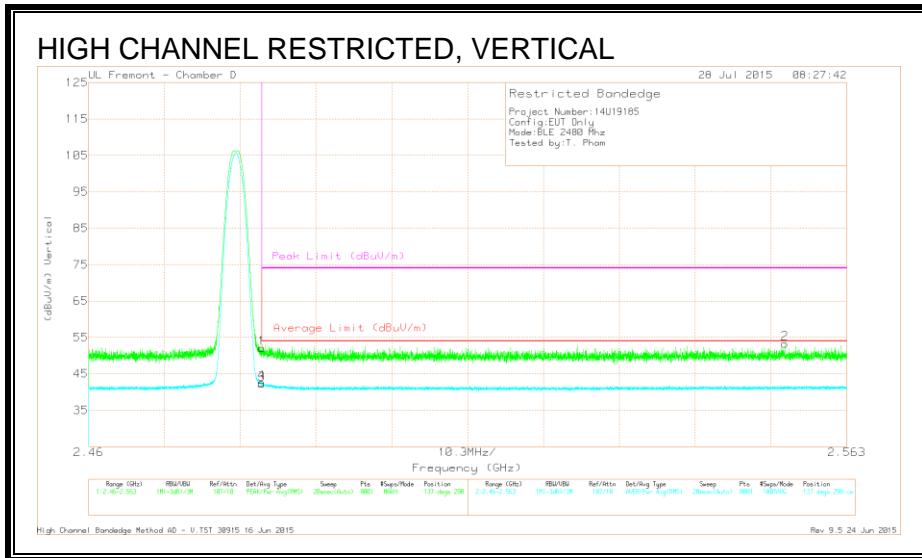
## DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	37.91	Pk	32.2	-20.8	49.31	-	-	74	-24.69	280	270	H
2	2.501	41.74	Pk	32.2	-20.7	53.24	-	-	74	-20.76	280	270	H
3	* 2.484	29.78	RMS	32.2	-20.8	41.18	54	-12.82	-	-	280	270	H
4	2.556	30.18	RMS	32.3	-20.7	41.78	54	-12.22	-	-	280	270	H

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

PK - Peak detector

RMS - RMS detection



## DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	40.61	Pk	32.2	-20.8	52.01	-	-	74	-21.99	137	298	V
2	2.555	41.73	Pk	32.3	-20.7	53.33	-	-	74	-20.67	137	298	V
3	* 2.484	30.79	RMS	32.2	-20.8	42.19	54	-11.81	-	-	137	298	V
4	* 2.484	31.24	RMS	32.2	-20.8	42.64	54	-11.36	-	-	137	298	V

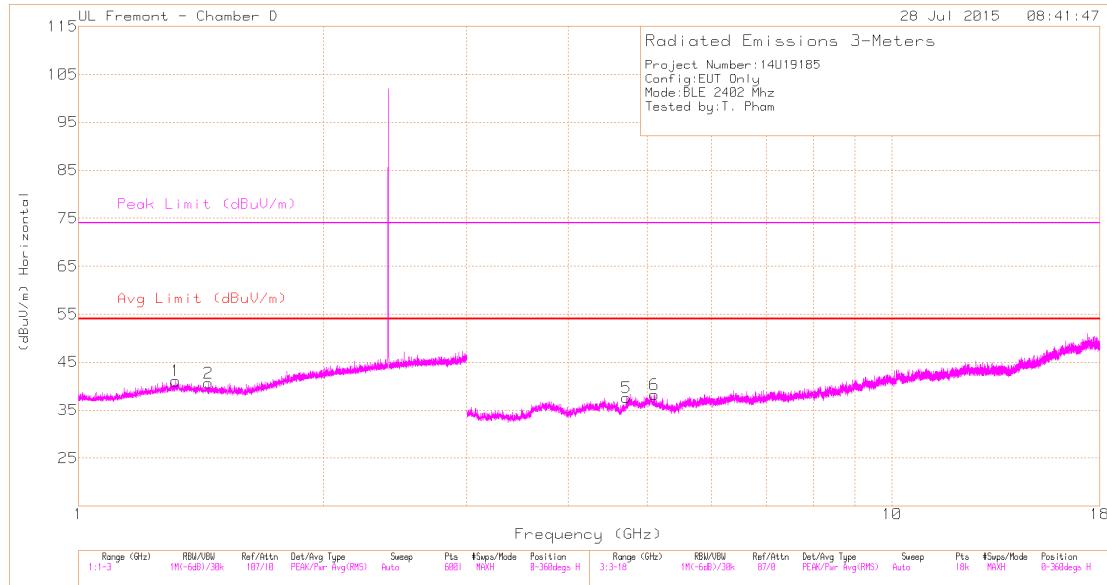
\* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

RMS - RMS detection

## 8.2.2. HARMONICS AND SPURIOUS EMISSIONS

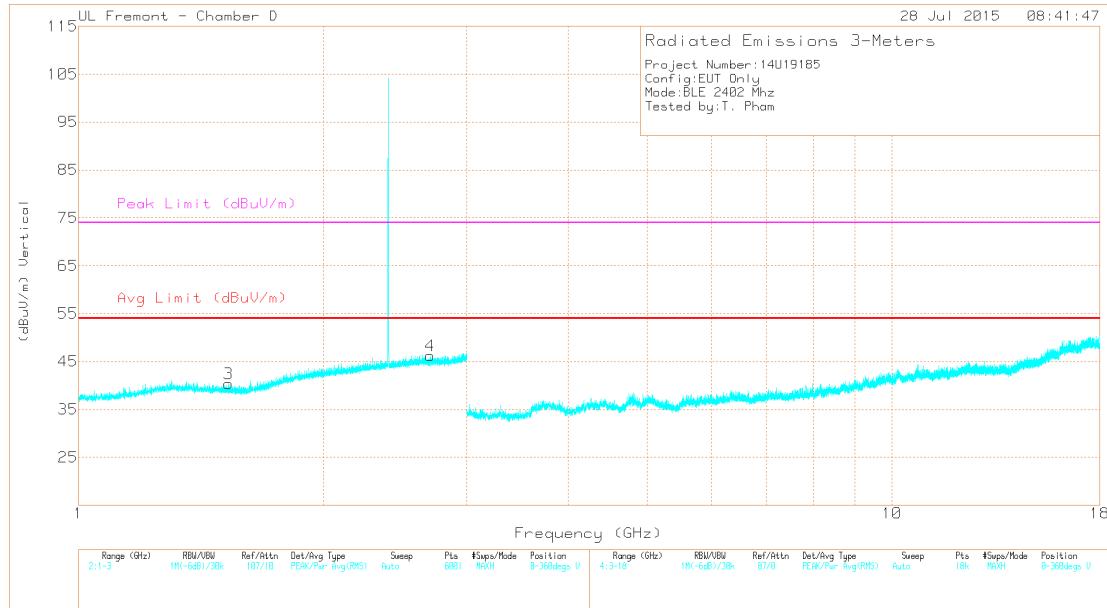
### LOW CHANNEL HORIZONTAL



BLE 2402 08.DAT 30915 23 Jun 2015

Rev 9.5 24 Jun 2015

### LOW CHANNEL VERTICAL



BLE 2402 08.DAT 30915 23 Jun 2015

Rev 9.5 24 Jun 2015

**DATA**

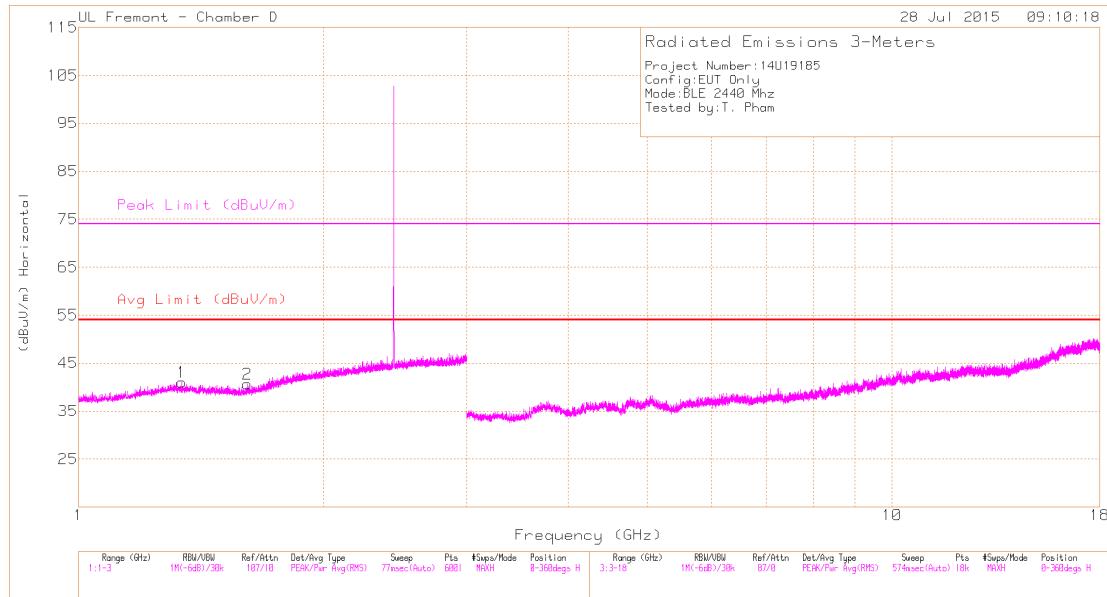
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.316	42.03	PK2	28.9	-22.3	48.63	-	-	74	-25.37	7	387	H
	* 1.316	29.96	MAv1	28.9	-22.3	36.56	54	-17.46	-	-	7	387	H
2	* 1.445	42.31	PK2	28.4	-22	48.71	-	-	74	-25.29	57	342	H
	* 1.444	30.22	MAv1	28.4	-22	36.62	54	-17.38	-	-	57	342	H
3	* 1.528	42.38	PK2	28.2	-21.9	48.68	-	-	74	-25.32	41	322	V
	* 1.529	30.1	MAv1	28.2	-21.9	36.4	54	-17.6	-	-	41	322	V
4	* 2.705	42.41	PK2	32.5	-20.6	54.31	-	-	74	-19.69	78	290	V
	* 2.705	30.38	MAv1	32.5	-20.6	42.28	54	-11.72	-	-	78	290	V
5	* 4.712	39.16	PK2	34.2	-27.3	46.06	-	-	74	-27.94	117	303	H
	* 4.713	27.17	MAv1	34.2	-27.3	34.07	54	-19.94	-	-	117	303	H
6	* 5.108	38.55	PK2	34.2	-27.3	45.45	-	-	74	-28.55	90	276	H
	* 5.108	27.25	MAv1	34.2	-27.3	34.15	54	-19.85	-	-	90	276	H

\* - indicates frequency in CFR15.205/IC8.10 Restricted Band

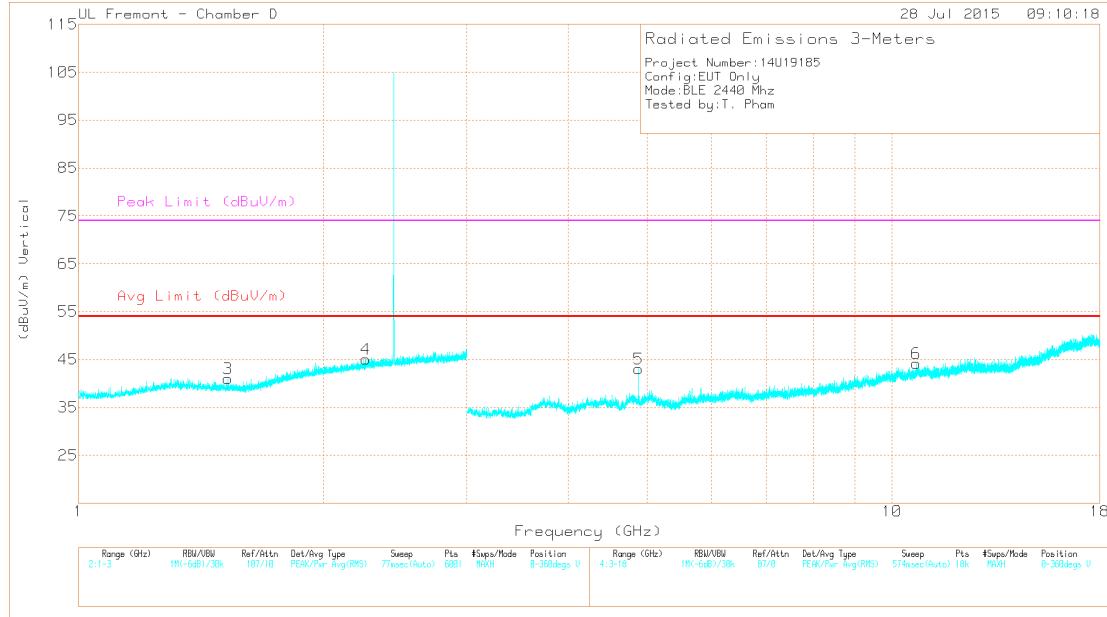
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



**DATA**

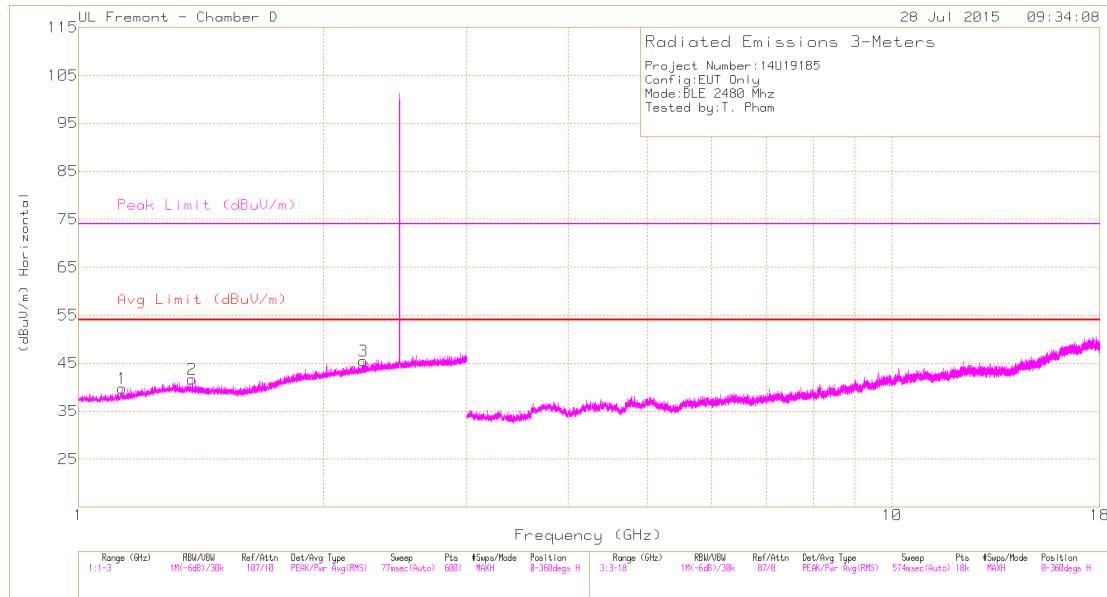
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.337	42.08	PK2	28.9	-22.2	48.78	-	-	74	-25.22	72	172	H
	* 1.34	30.32	MAv1	28.8	-22.2	36.92	54	-17.08	-	-	72	172	H
2	* 1.613	41.92	PK2	28.1	-21.8	48.22	-	-	74	-25.78	110	193	H
	* 1.613	30.13	MAv1	28.1	-21.8	36.43	54	-17.57	-	-	110	193	H
3	* 1.526	42.28	PK2	28.2	-21.9	48.58	-	-	74	-25.42	153	174	V
	* 1.529	30.19	MAv1	28.2	-21.9	36.49	54	-17.51	-	-	153	174	V
4	* 2.252	41.56	PK2	31.8	-21.1	52.26	-	-	74	-21.74	198	185	V
	* 2.251	30.12	MAv1	31.8	-21.1	40.82	54	-13.18	-	-	198	185	V
5	* 4.881	42.96	PK2	34.1	-28.1	48.96	-	-	74	-25.04	220	267	V
	* 4.88	35.43	MAv1	34.1	-28.1	41.43	54	-12.57	-	-	220	267	V
6	* 10.711	34.62	PK2	37.9	-20.9	51.62	-	-	74	-22.38	184	238	V
	* 10.71	22.9	MAv1	37.9	-20.9	39.9	54	-14.1	-	-	184	238	V

\* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

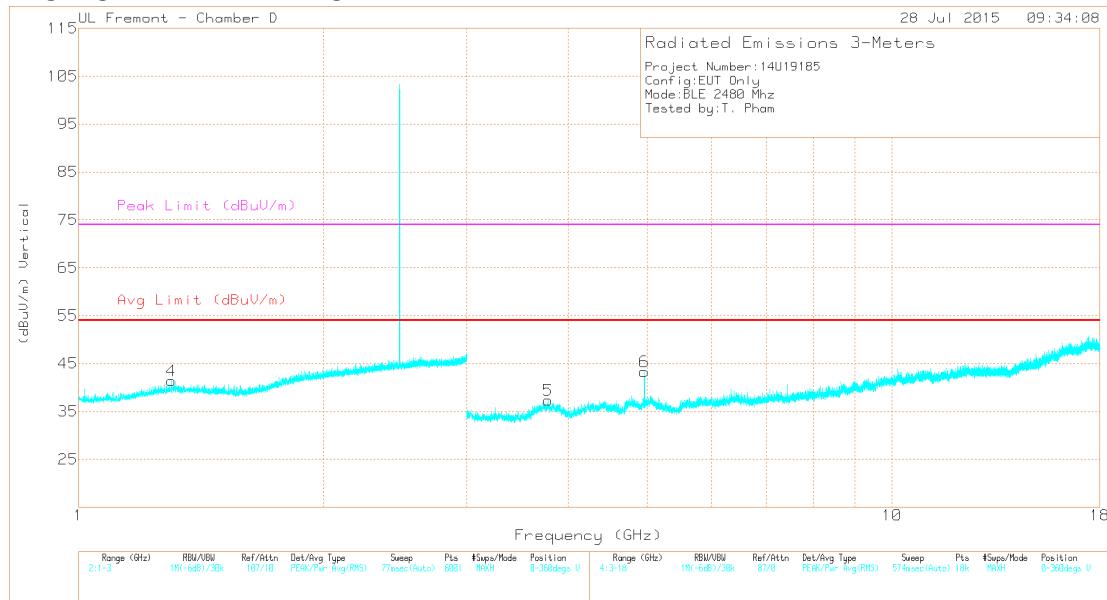
### HIGH CHANNEL HORIZONTAL



FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 23 Jun 2015

Rev 9.5 24 Jun 2015

### HIGH CHANNEL VERTICAL



FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 23 Jun 2015

Rev 9.5 24 Jun 2015

**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.133	41.8	PK2	27.5	-22.5	46.8	-	-	74	-27.2	21	198	H
	* 1.13	30.38	MAv1	27.5	-22.5	35.38	54-	-18.62	-	-	21	198	H
2	* 1.378	41.98	PK2	28.7	-22.2	48.48	-	-	74	-25.52	251	152	H
	* 1.378	30.58	MAv1	28.7	-22.2	37.08	54	-17.92	-	-	251	152	H
3	* 2.24	41.84	PK2	31.7	-21	52.54	-	-	74	-21.46	238	140	H
	* 2.243	30.22	MAv1	31.8	-21	41.02	54	-12.98	-	-	238	140	H
4	* 1.303	43.22	PK2	29	-22.3	49.92	-	-	74	-24.08	199	196	V
	* 1.303	30.4	MAv1	29	-22.3	37.1	54	-17.9	-	-	199	196	V
5	* 3.775	39.07	PK2	33.3	-28.3	44.07	-	-	74	-29.93	220	235	V
	* 3.774	27.18	MAv1	33.3	-28.3	32.18	54	-22.82	-	-	220	235	V
6	* 4.959	43.56	PK2	34.2	-27.7	50.06	-	-	74	-23.94	57	271	V
	* 4.96	36.47	MAv1	34.2	-27.7	42.97	54	-11.03	-	-	57	271	V

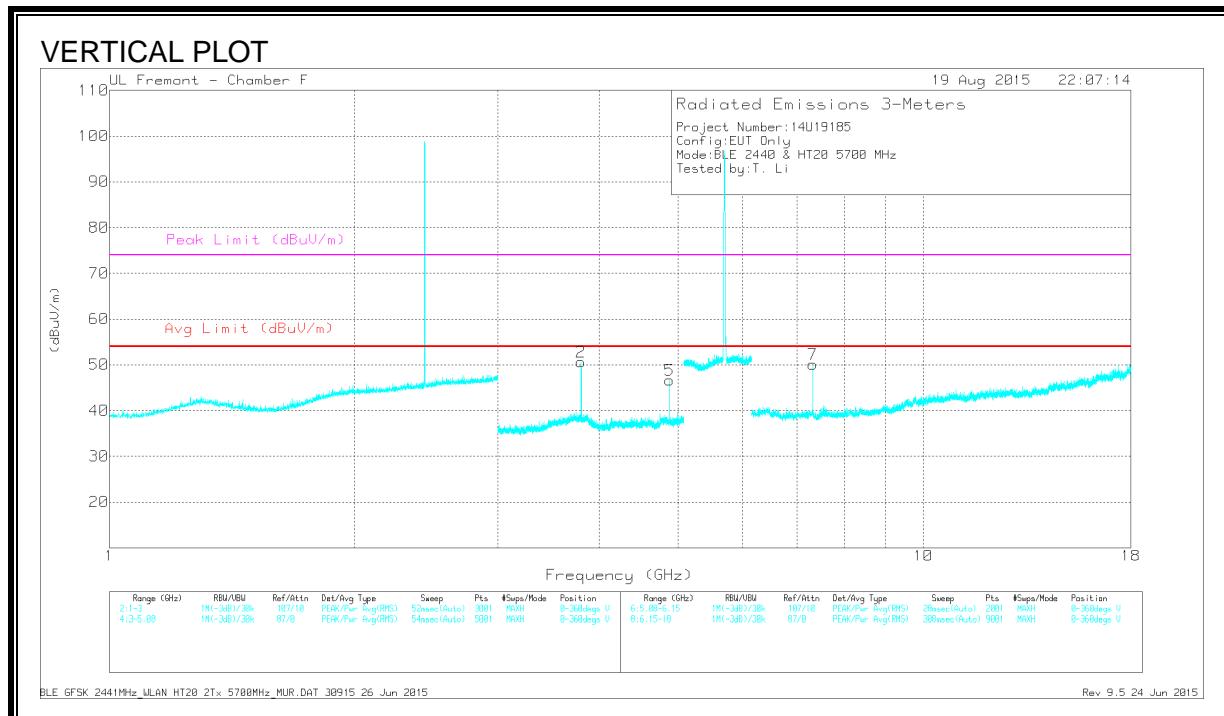
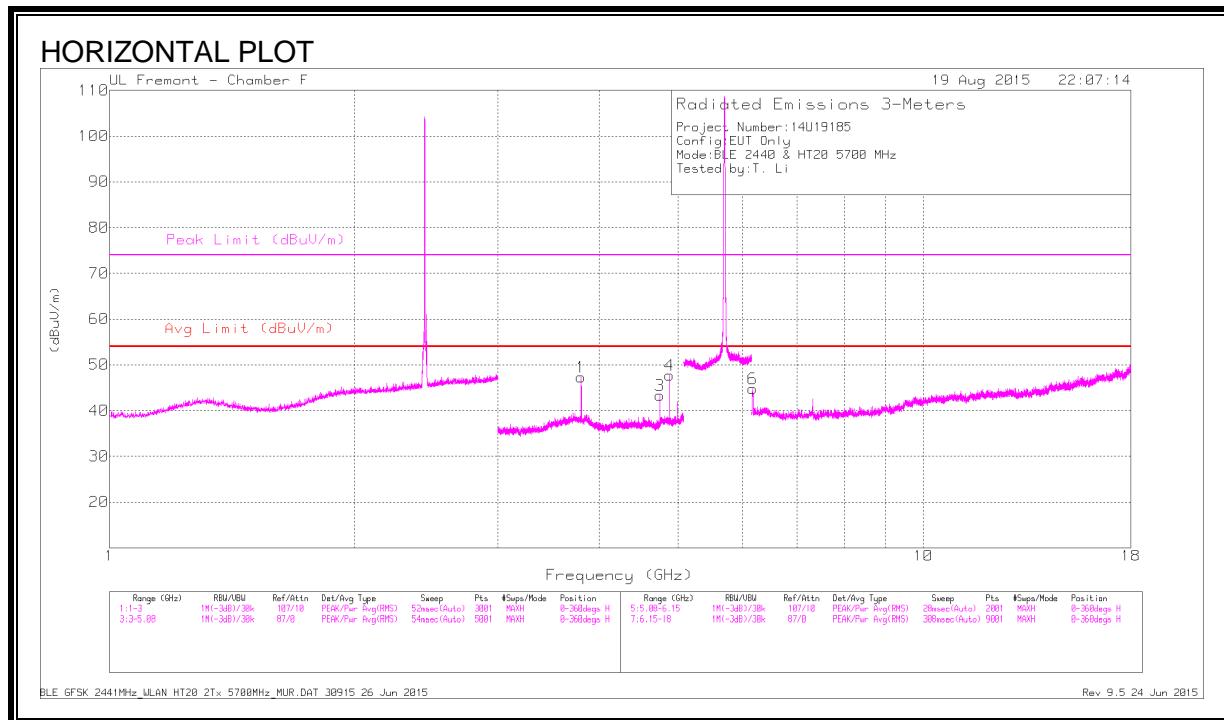
\* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

### 8.3. WORST CASE CO-LOCATION

#### BLUETOOTH LOW ENERGY AND 802.11 HT20 2Tx CDD MODE IN THE 5.6GHz BAND



**HORIZONTAL AND VERTICAL DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AFT120 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.8	44.31	PK	34.1	-28.9	49.51	-	-	74	-24.49	238	106	H
	* 3.8	39.07	MAv1	34.1	-28.9	44.27	53.97	-9.7	-	-	238	106	H
3	* 4.75	42.79	PK	34.1	-28.4	48.49	-	-	74	-25.51	155	128	H
	* 4.75	35.36	MAv1	34.1	-28.4	41.06	53.97	-12.91	-	-	155	128	H
4	* 4.88	43.62	PK	34.1	-27.9	49.82	-	-	74	-24.18	129	208	H
	* 4.88	37.44	MAv1	34.1	-27.9	43.64	53.97	-10.33	-	-	129	208	H
2	* 3.8	47.61	PK	34.1	-28.9	52.81	-	-	74	-21.19	209	178	V
	* 3.8	44.06	MAv1	34.1	-28.9	49.26	53.97	-4.71	-	-	209	178	V
5	* 4.88	43.26	PK	34.1	-27.9	49.46	-	-	74	-24.54	174	102	V
	* 4.88	36.98	MAv1	34.1	-27.9	43.18	53.97	-10.79	-	-	174	102	V
7	* 7.319	44.24	PK	35.7	-25.3	54.64	-	-	74	-19.36	155	163	V
	* 7.319	37.76	MAv1	35.7	-25.3	48.16	53.97	-5.81	-	-	155	163	V
6	6.172	42.78	PK	35.7	-26.7	51.78	-	-	74	-22.22	156	105	H

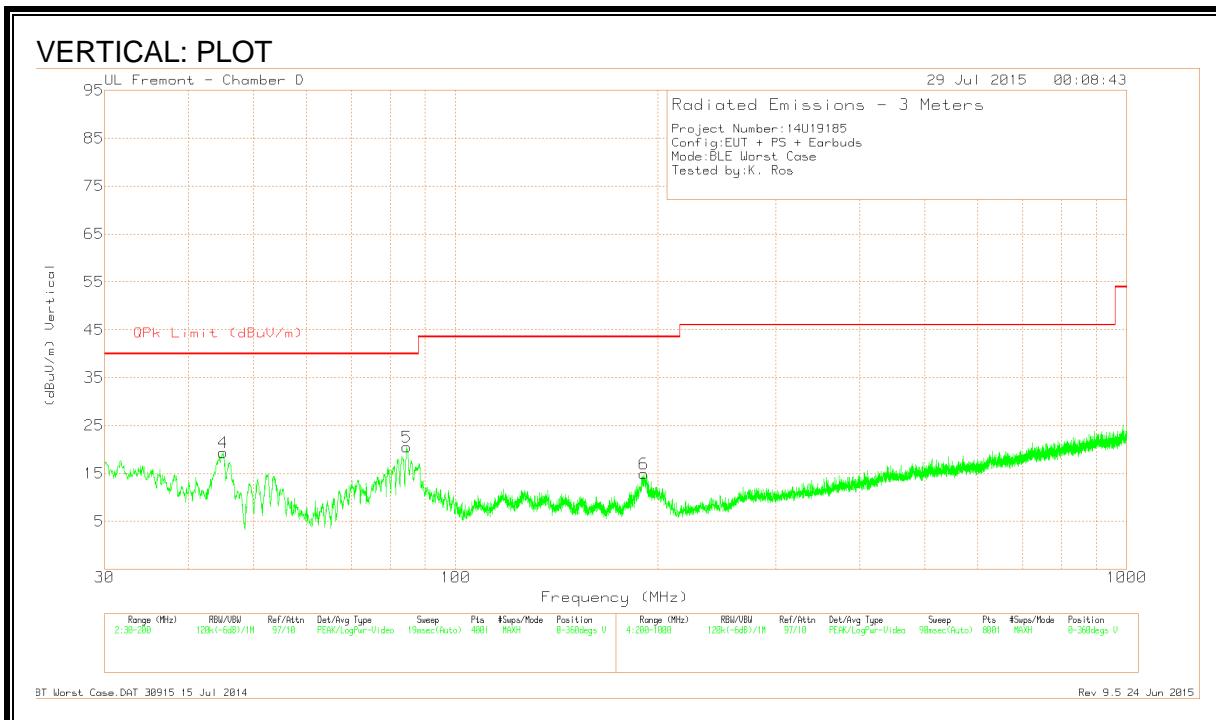
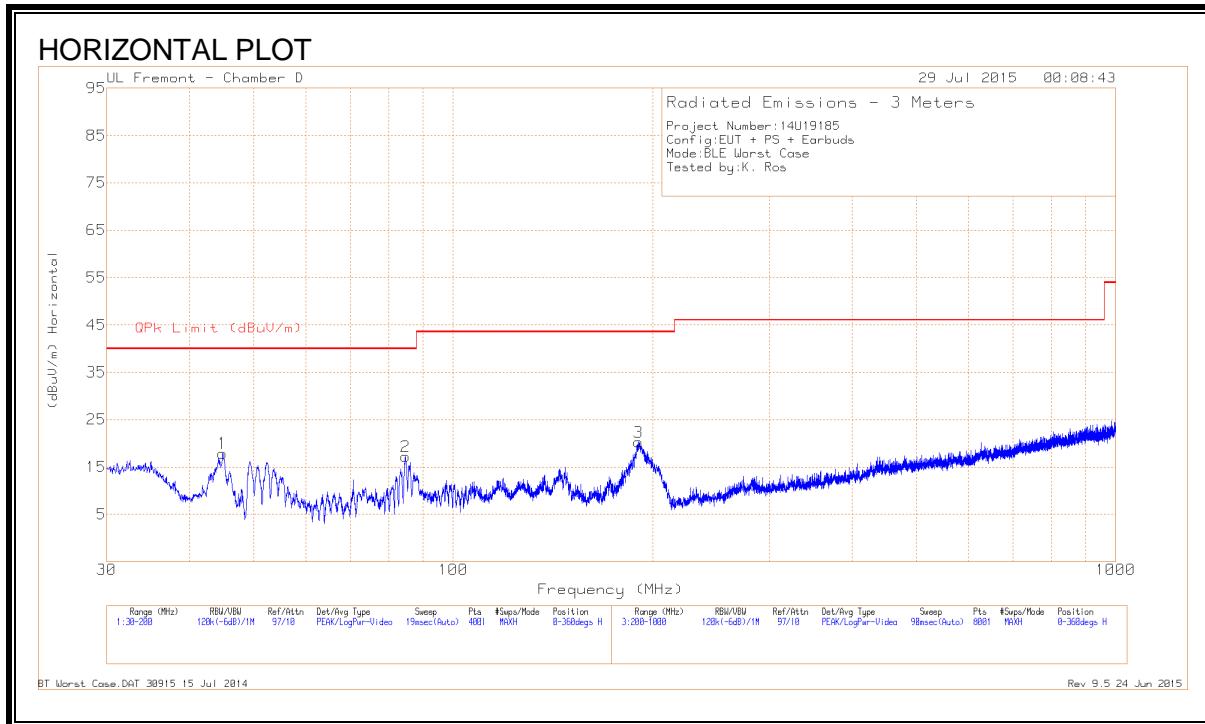
\* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

## 8.4. WORST-CASE BELOW 1 GHz

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



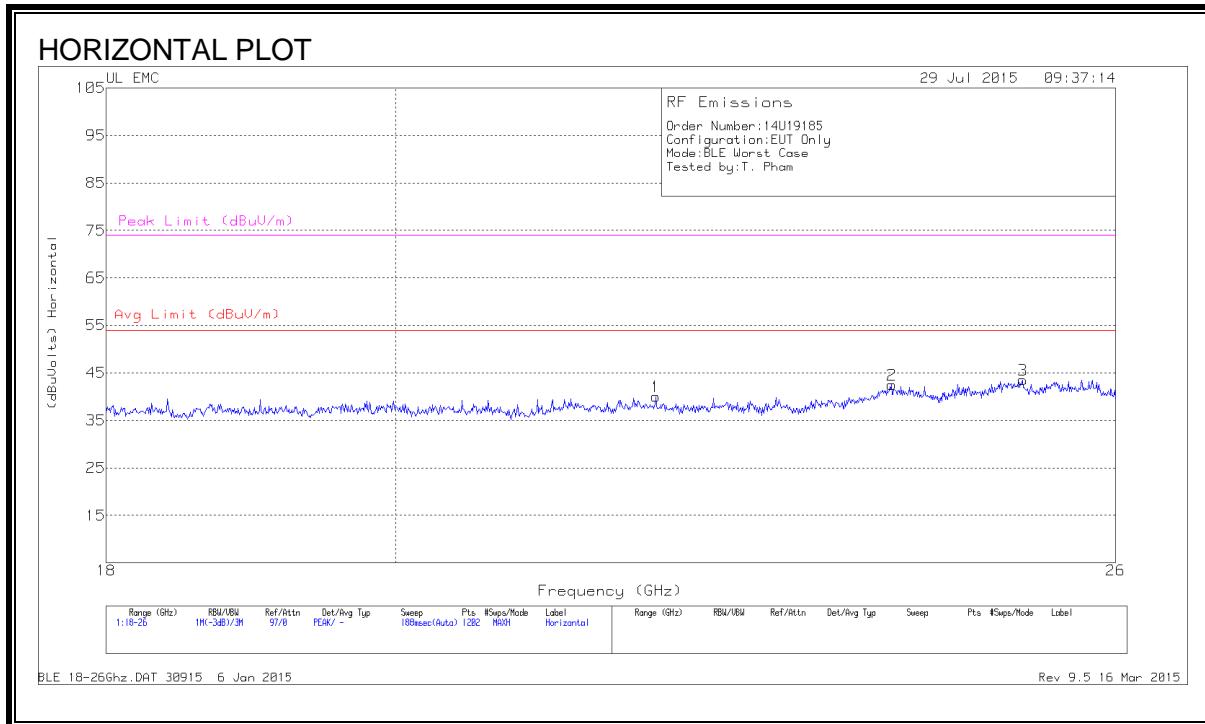
**DATA**

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T407 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	44.875	38.82	Pk	10.9	-31.8	17.92	40	-22.08	0-360	301	H
4	45.0875	40.52	Pk	10.7	-31.8	19.42	40	-20.58	0-360	103	V
5	84.655	44.51	Pk	7.4	-31.4	20.51	40	-19.49	0-360	103	V
2	84.7825	41.17	Pk	7.4	-31.4	17.17	40	-22.83	0-360	201	H
3	190.395	39.92	Pk	11.2	-30.9	20.22	43.52	-23.3	0-360	201	H
6	190.7775	34.55	Pk	11.3	-30.9	14.95	43.52	-28.57	0-360	103	V

Pk - Peak detector

## 8.5. WORST-CASE ABOVE 18 GHz

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



**DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	21.99	41.40	Pk	33.2	-25.1	-9.5	40.0	54	-14.0	74	-34.0
2	23.962	42.90	Pk	33.3	-24.2	-9.5	42.5	54	-11.5	74	-31.5
3	25.134	43.90	Pk	33.8	-24.7	-9.5	43.5	54	-10.5	74	-30.5
4	23.495	41.30	Pk	33.2	-24.5	-9.5	40.5	54	-13.5	74	-33.5
5	24.561	43.17	Pk	33.9	-23.9	-9.5	43.67	54	-10.3	74	-30.3
6	24.981	43.17	Pk	34.2	-24.2	-9.5	43.67	54	-10.3	74	-30.3

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 $\mu$ 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

C63.10.

### RESULTS

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

### Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B	Margin (dB)
								Avg		
1	.1995	36.87	Pk	.9	0	37.77	63.63	-25.86	-	-
2	.1995	27.73	Av	.9	0	28.63	-	-	53.63	-25
3	.249	36.92	Pk	.7	0	37.62	61.79	-24.17	-	-
4	.249	27.37	Av	.7	0	28.07	-	-	51.79	-23.72
5	.303	36.89	Pk	.5	0	37.39	60.16	-22.77	-	-
6	.303	26.65	Av	.5	0	27.15	-	-	50.16	-23.01
7	.3525	34.2	Pk	.5	0	34.7	58.9	-24.2	-	-
8	.3525	24.98	Av	.5	0	25.48	-	-	48.9	-23.42
9	.5775	42.6	Pk	.3	0	42.9	56	-13.1	-	-
10	.5775	31.55	Av	.3	0	31.85	-	-	46	-14.15
11	18.8025	40.6	Pk	.3	.2	41.1	60	-18.9	-	-
12	18.81825	26.62	Av	.3	.2	27.12	-	-	50	-22.88

Pk - Peak detector

Av - Average detection

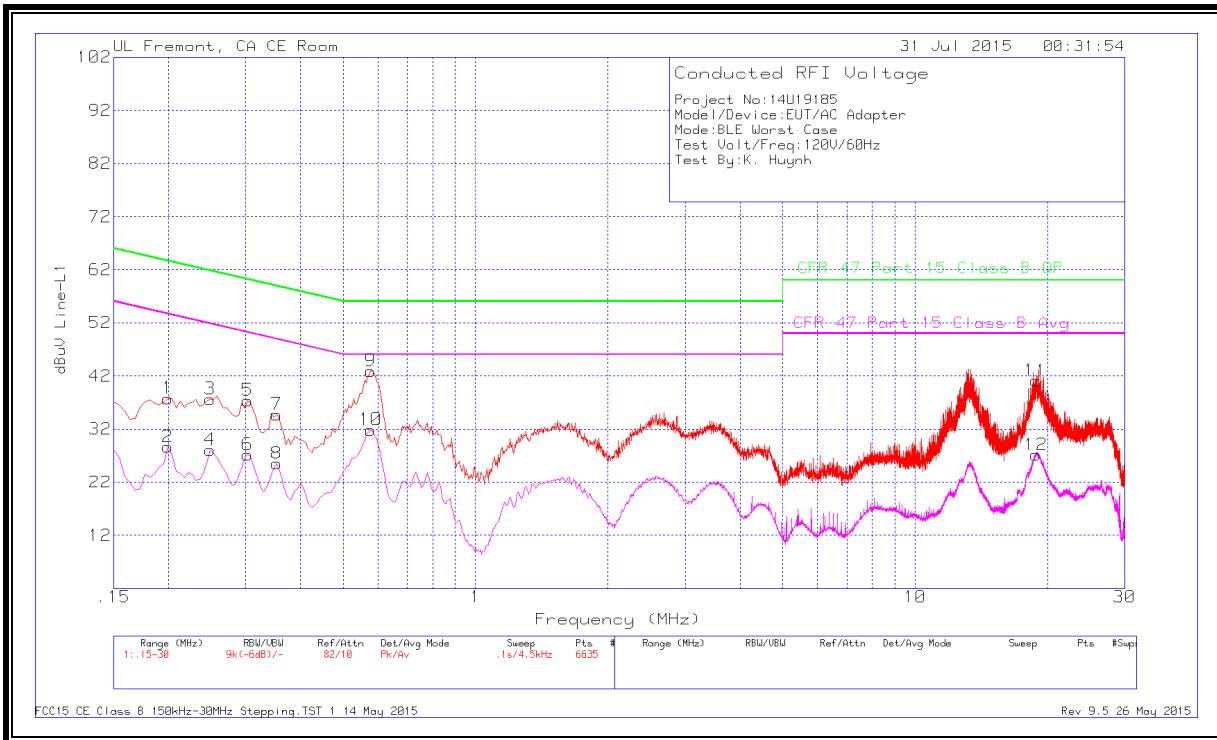
### Range 2: Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B	Margin (dB)
								Avg		
13	.1995	36.68	Pk	1	0	37.68	63.63	-25.95	-	-
14	.1995	25.08	Av	1	0	26.08	-	-	53.63	-27.55
15	.249	37.3	Pk	.7	0	38	61.79	-23.79	-	-
16	.249	24.13	Av	.7	0	24.83	-	-	51.79	-26.96
17	.30075	36.84	Pk	.6	0	37.44	60.22	-22.78	-	-
18	.303	22.45	Av	.6	0	23.05	-	-	50.16	-27.11
19	.348	34.94	Pk	.5	0	35.44	59.01	-23.57	-	-
20	.3525	20.62	Av	.5	0	21.12	-	-	48.9	-27.78
21	.582	36.91	Pk	.3	0	37.21	56	-18.79	-	-
22	.582	23.79	Av	.3	0	24.09	-	-	46	-21.91

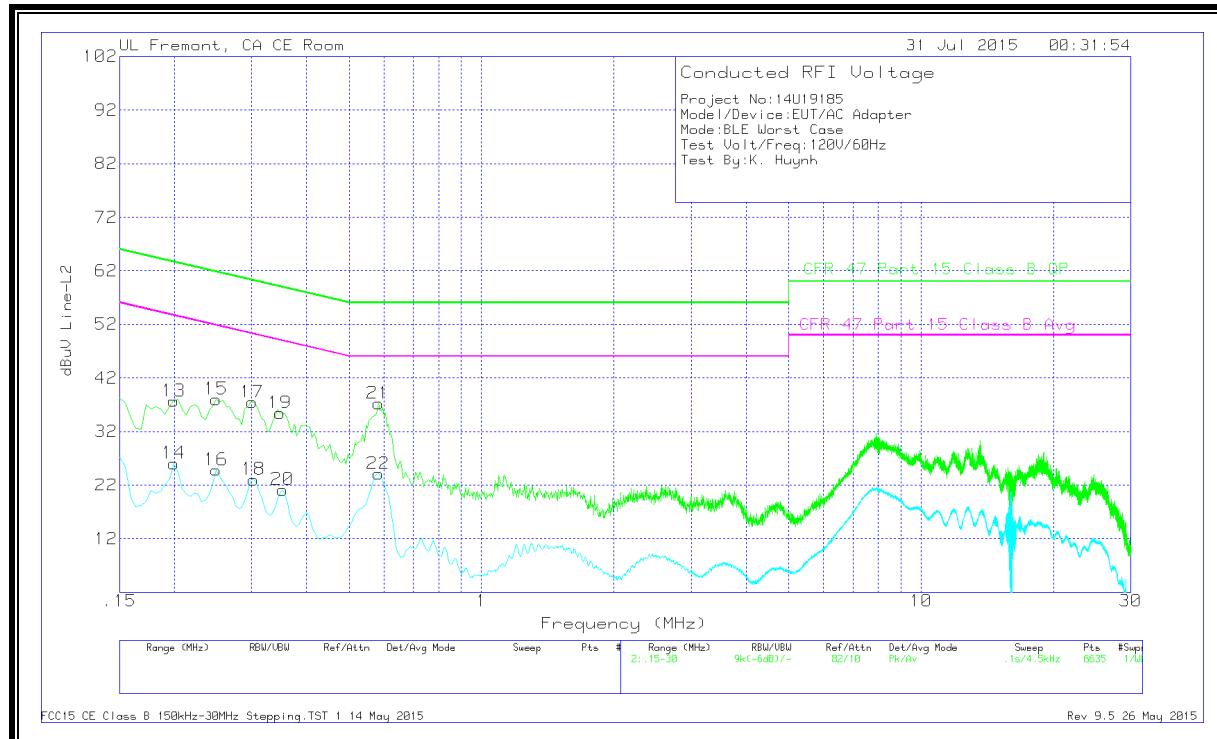
Pk - Peak detector

Av - Average detection

## LINE 1 RESULTS



## LINE 2 RESULTS



## 9.2. EUT POWERED BY HOST PC VIA USB CABLE

### 6 WORST EMISSIONS

Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B	Margin (dB)
1	.15	53.7	Pk	1.4	0	55.1	66	-10.9		
2	.15	42.13	Av	1.4	0	43.53	-	-	56	-12.47
3	.4425	37.82	Pk	.4	0	38.22	57.01	-18.79		
4	.438	26.55	Av	.4	0	26.95	-	-	47.1	-20.15
5	.7305	40.36	Pk	.3	0	40.66	56	-15.34		
6	.735	27.59	Av	.3	0	27.89	-	-	46	-18.11
7	1.023	40.36	Pk	.2	0	40.56	56	-15.44		
8	1.023	24.3	Av	.2	0	24.5	-	-	46	-21.5
9	13.137	41.81	Pk	.2	.2	42.21	60	-17.79		
10	13.245	27.61	Av	.2	.2	28.01	-	-	50	-21.99
11	18.591	43.84	Pk	.3	.2	44.34	60	-15.66		
12	18.708	29.24	Av	.3	.2	29.74	-	-	50	-20.26

Pk - Peak detector

Av - Average detection

Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B	Margin (dB)
13	.15	50.91	Pk	1.5	0	52.41	66	-13.59		
14	.15	44.55	Av	1.5	0	46.05	-	-	56	-9.95
15	.4425	36.15	Pk	.4	0	36.55	57.01	-20.46		
16	.4515	25.85	Av	.4	0	26.25	-	-	46.85	-20.6
17	.708	37.16	Pk	.3	0	37.46	56	-18.54		
18	.708	21.89	Av	.3	0	22.19	-	-	46	-23.81
19	1.023	38.63	Pk	.3	0	38.93	56	-17.07		
20	1.023	22.56	Av	.3	0	22.86	-	-	46	-23.14
21	13.2945	49.07	Pk	.2	.2	49.47	60	-10.53		
22	13.3575	32.48	Av	.2	.2	32.88	-	-	50	-17.12
23	18.6585	45.43	Pk	.3	.2	45.93	60	-14.07		
24	18.654	29.91	Av	.3	.2	30.41	-	-	50	-19.59

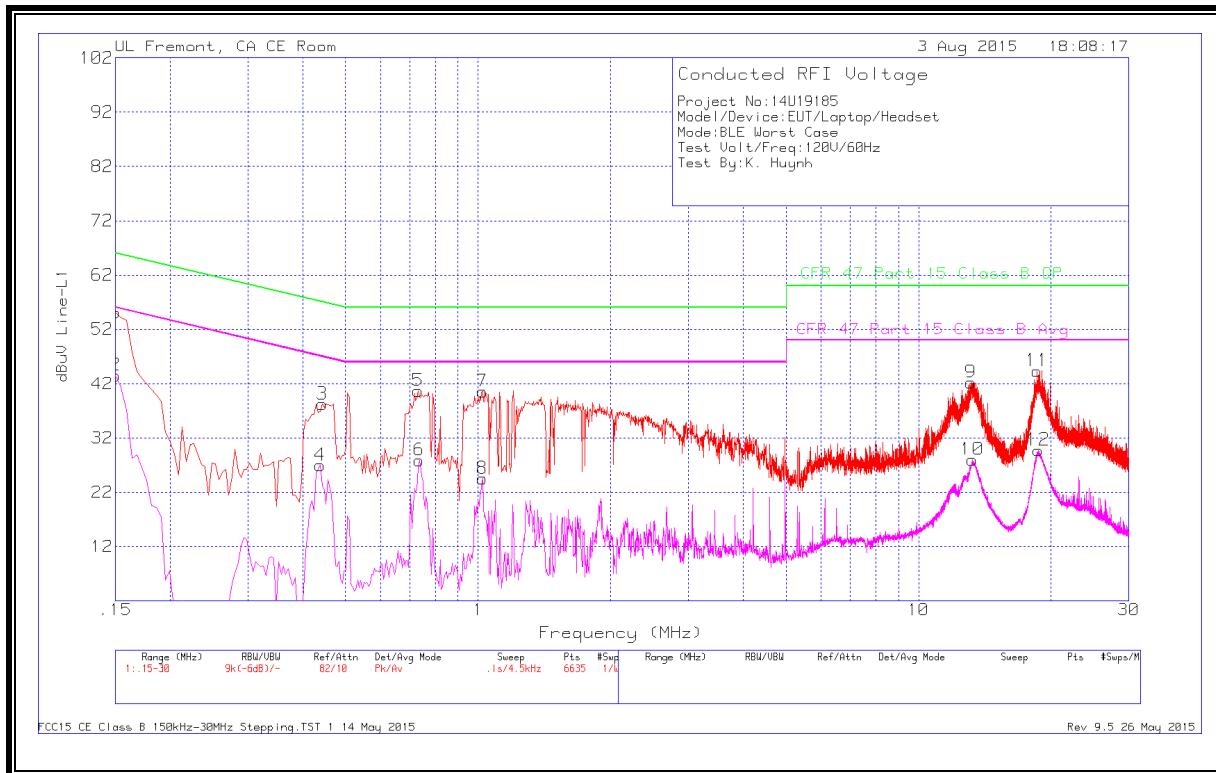
Pk - Peak detector

Av - Average detection

FCC15 CE Class B 150kHz-30MHz Stepping.TST 1 14 May 2015

Rev 9.5 26 May 2015

## LINE 1 RESULTS



**LINE 2 RESULTS**

