



**FCC CFR47 PART 15 SUBPART C**

**BLUETOOTH LOW ENERGY  
CERTIFICATION TEST REPORT**

**FOR**

**GSM/CDMA/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n/ac and NFC**

**MODEL NUMBER: LGLS990, LG-LS990, LS990**

**FCC ID: ZNFLS990**

**REPORT NUMBER: 14U17501-3**

**ISSUE DATE: MAY 5, 2014**

*Prepared for*  
**LG ELECTRONICS MOBILECOMM U.S.A., INC**  
**1000 SYLVAN AVENUE**  
**ENGLEWOOD CLIFFS,**  
**NEW JERSEY, 07632, 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 LAB CODE 200065-0**

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	5/5/14	Initial Issue	P. Kim

## TABLE OF CONTENTS

<b>1. ATTESTATION OF TEST RESULTS</b>	<b>4</b>
<b>2. TEST METHODOLOGY</b>	<b>5</b>
<b>3. FACILITIES AND ACCREDITATION</b>	<b>5</b>
<b>4. CALIBRATION AND UNCERTAINTY</b>	<b>5</b>
4.1. <i>MEASURING INSTRUMENT CALIBRATION</i>	5
4.2. <i>SAMPLE CALCULATION</i>	5
4.3. <i>MEASUREMENT UNCERTAINTY</i>	5
<b>5. EQUIPMENT UNDER TEST</b>	<b>6</b>
5.1. <i>DESCRIPTION OF EUT</i>	6
5.2. <i>MAXIMUM OUTPUT POWER</i>	6
5.3. <i>DESCRIPTION OF AVAILABLE ANTENNAS</i>	6
5.4. <i>WORST-CASE CONFIGURATION AND MODE</i>	7
5.5. <i>DESCRIPTION OF TEST SETUP</i>	8
<b>6. TEST AND MEASUREMENT EQUIPMENT</b>	<b>10</b>
<b>7. SUMMARY</b>	<b>11</b>
<b>8. ANTENNA PORT TEST RESULTS</b>	<b>12</b>
8.1. <i>6 dB BANDWIDTH</i>	12
8.2. <i>99% BANDWIDTH</i>	15
8.3. <i>OUTPUT POWER</i>	18
8.4. <i>AVERAGE POWER</i>	21
8.5. <i>POWER SPECTRAL DENSITY</i>	22
8.6. <i>CONDUCTED SPURIOUS EMISSIONS</i>	25
<b>9. RADIATED TEST RESULTS</b>	<b>29</b>
9.1. <i>LIMITS AND PROCEDURE</i>	29
9.2. <i>TRANSMITTER ABOVE 1 GHz</i>	30
<i>WORST-CASE BELOW 1 GHz</i>	46
<i>WORST-CASE WITH WPC CHARGER AND COVER BELOW 1 GHz</i>	49
<b>10. AC POWER LINE CONDUCTED EMISSIONS</b>	<b>52</b>
<b>11. SETUP PHOTOS</b>	<b>56</b>

# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** LG ELECTRONICS MOBILECOMM U.S.A., INC.

**EUT DESCRIPTION:** GSM/CDMA/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n/ac and NFC.

**MODEL:** LGLS990, LG-LS990, LS990

**SERIAL NUMBER:** 133E3 (Conducted), 133E4 (Radiated)

**DATE TESTED:** APRIL 16- MAY 5, 2014

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:

Tested By:



PHILIP KIM  
CONSUMER TECHNOLOGY DIVISION  
PROGRAM MANAGER  
UL Verification Services Inc.

CHARLES VERGONIO  
CONSUMER TECHNOLOGY DIVISION  
LAB ENGINEER  
UL Verification Services Inc.

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccssemc.com>.

## 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	3.52 dB
Radiated Disturbance, 30 to 18000 MHz	4.94 dB

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a GSM/CDMA/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n/ac and NFC.

### 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	4.88	3.08

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -4dBi.

---

#### **5.4. 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.

## 5.5. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	LG	MCS-04WT2	TA350000050	N/A
Earphone	LG	N/A	N/A	N/A
WPC Cover	LG	N/A	N/A	N/A
WPC Charger	LG	WPC-300	304HYBF00069	BEJWCP300

### I/O CABLES

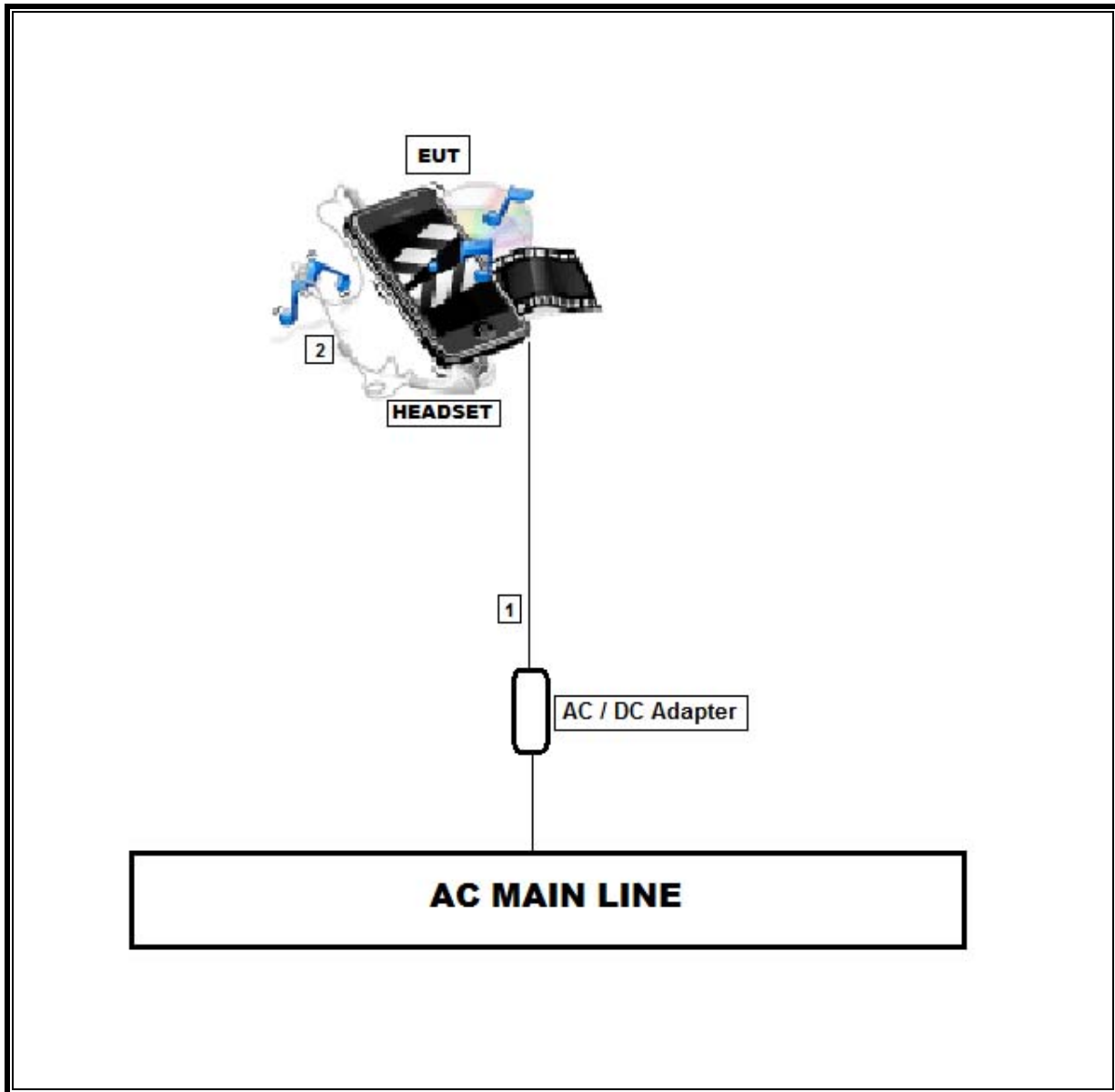
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini-USB	Shielded	1.2m	N/A
2	Audio	1	Mini-Jack	Unshielded	1m	N/A

### TEST SETUP

EUT was set in the Hidden menu mode to enable BLE communications.



**SETUP DIAGRAM FOR TESTS**



## 6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	Manufacturer	Model	Asset	Cal Due
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/14
Spectrum Analyzer,9KHz-40GHz	HP	8564E	C00986	04/01/15
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	1000741	08/13/14
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/18/14
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/14
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/14
Antenna, Horn, 1-18 GHz	ETS	3117	C01022	02/21/15
Antenna, Horn,18- 26 GHz	ARA	MWH-1826/B	C00946	11/12/14
Antenna, Horn, 26-40 GHz	ARA	MWH-2640	C00891	06/28/14
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	T243	03/06/15
RF Preamplifier, 100KHz -> 1300MHz	HP	TBD	C00825	06/01/14
RF Preamplifier, 1GHz - 18GHz	Miteq	NSP4000-SP2	924343	03/23/15
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	F00351	06/27/14
AC Power Supply, 2,500VA 45-500Hz	Elgar-Ametek	CW2501M	F00013	CNR
RF Preamplifier, 1GHz - 40GHz	Miteq	NSP4000-SP2	C00990	08/20/14
Attenuator / Switch driver	HP	11713A	F00204	CNR
Low Pass Filter 3GHz	Micro-Tronics	LPS17541	F00219	05/23/14
High Pass Filter 5GHz	Micro-Tronics	HPS17542	F00222	05/22/14
High Pass Filter 6GHz	Micro-Tronics	HPM17543	F00224	05/22/14

## 7. SUMMARY

Test Description	Test Limit	Test Condition	Test Result	Worst Case
Occupied Band width (6dB)	>500KHz	Conducted	Pass	752.4 KHz
Band Edge / Conducted Spurious Emission	-20dBc		Pass	-56.66
TX conducted output power	<30dBm		Pass	4.88 dBm
PSD	<8dBm		Pass	-9.27
AC Power Line conducted emissions	Section 10	Radiated	Pass	31.97dBuV
Radiated Spurious Emission	< 54dBuV/m		Pass	38.62dBuV/m

## 8. ANTENNA PORT TEST RESULTS

### 8.1. 6 dB BANDWIDTH

#### LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

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

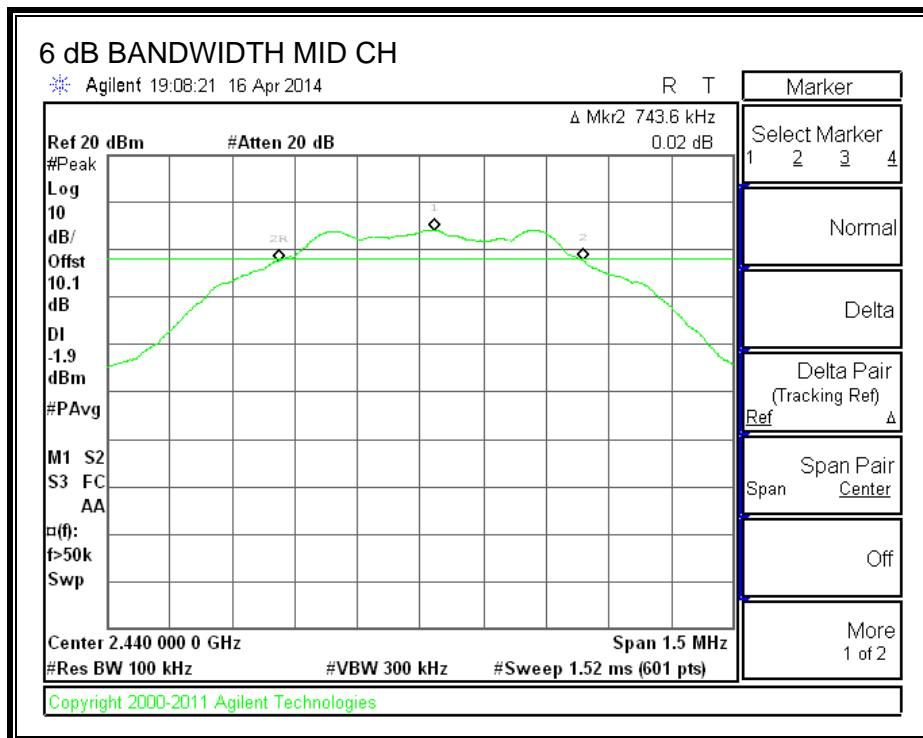
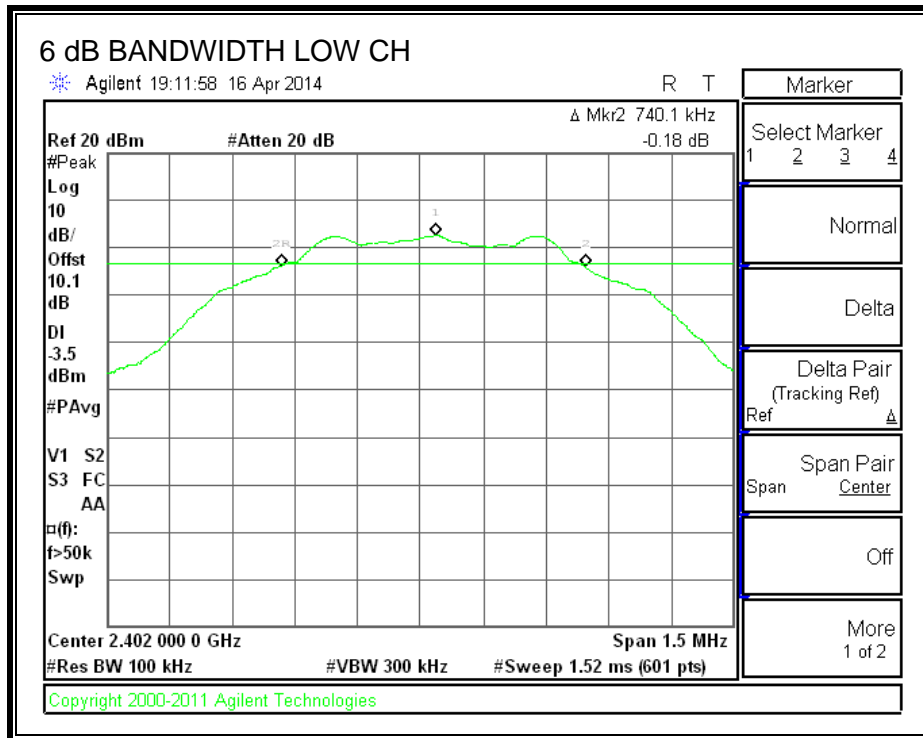
#### TEST PROCEDURE

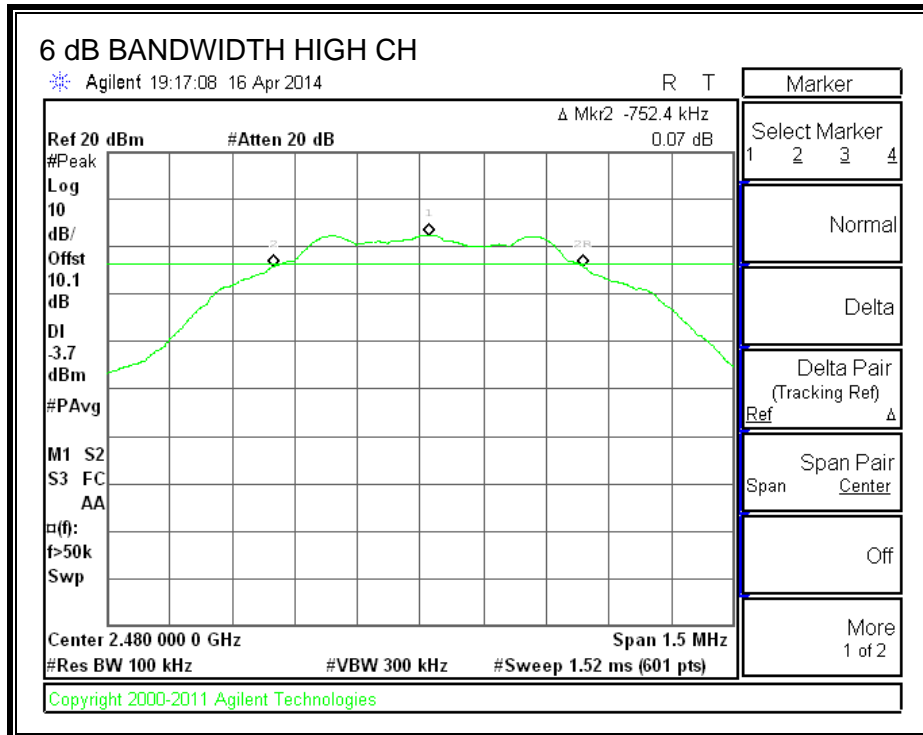
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

#### RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.7401	0.5
Middle	2440	0.7436	0.5
High	2480	0.7524	0.5

**6 dB BANDWIDTH**





## 8.2. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

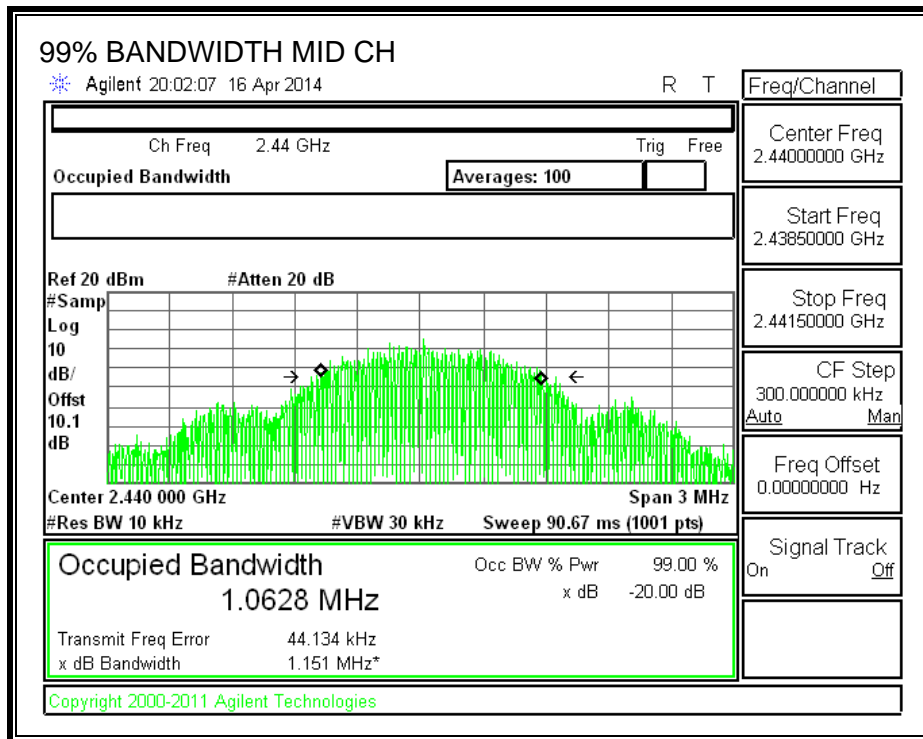
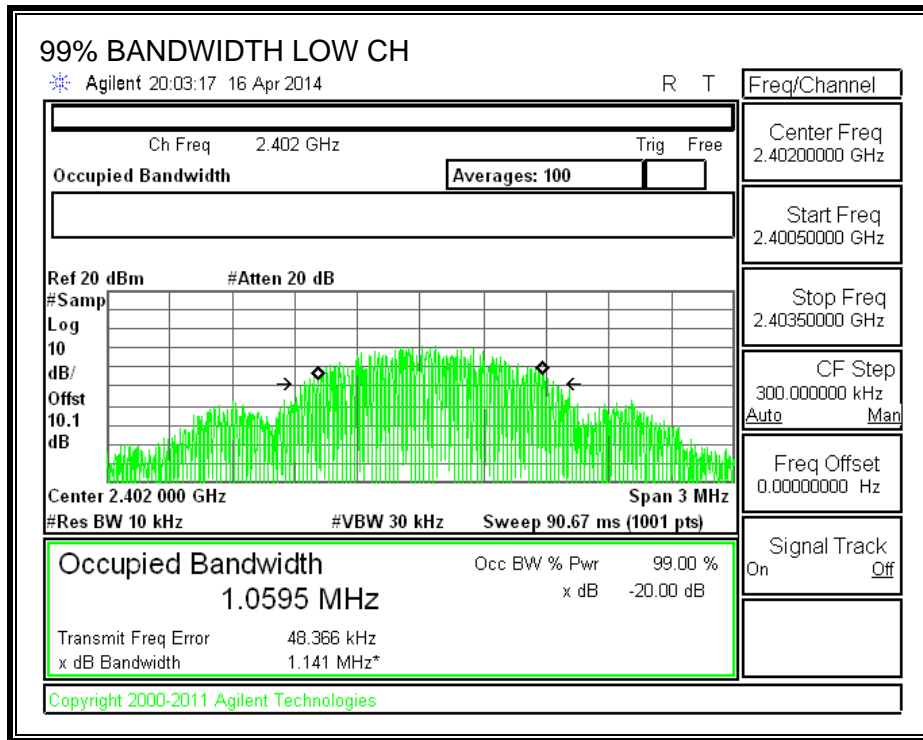
### TEST PROCEDURE

Reference to KDB558074 D01 DTS Meas Guidance v03r01: 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.

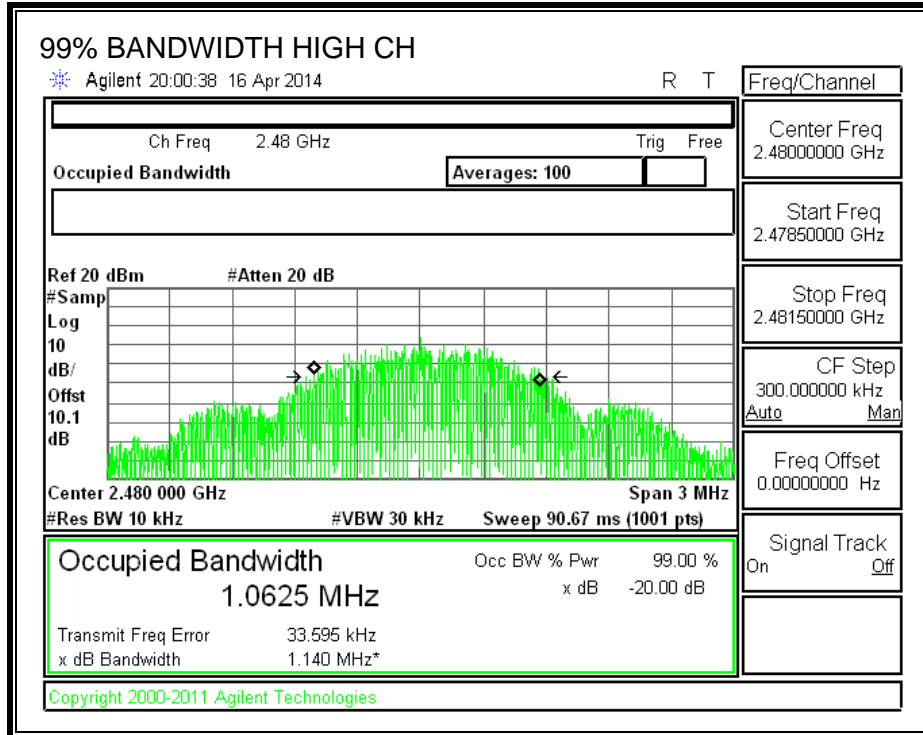
### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0595
Middle	2440	1.0628
High	2480	1.0625

**99% BANDWIDTH**







### 8.3. OUTPUT POWER

#### LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

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

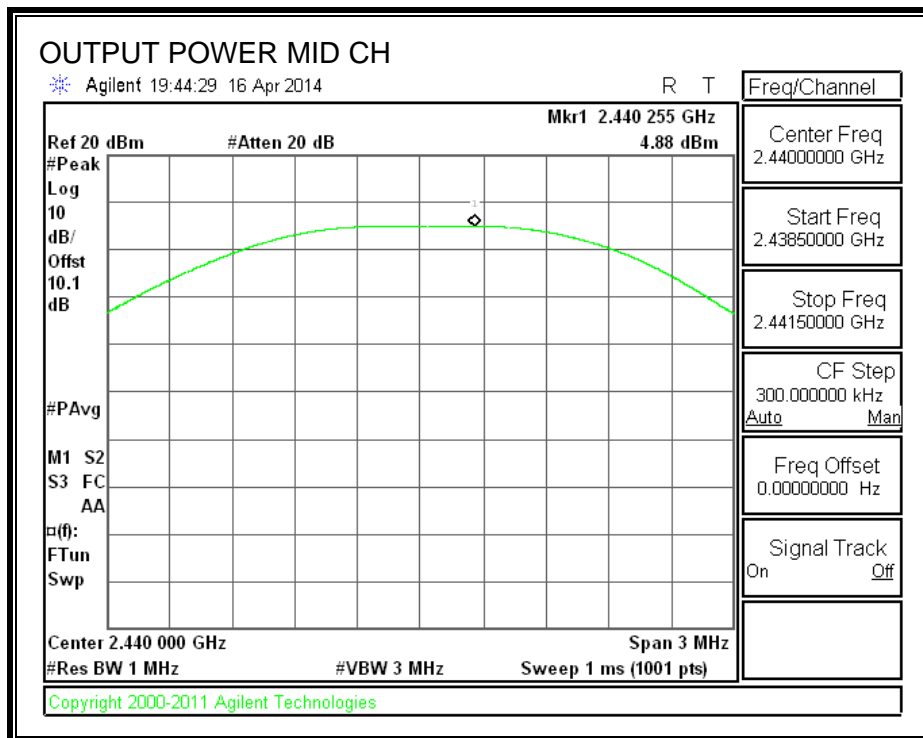
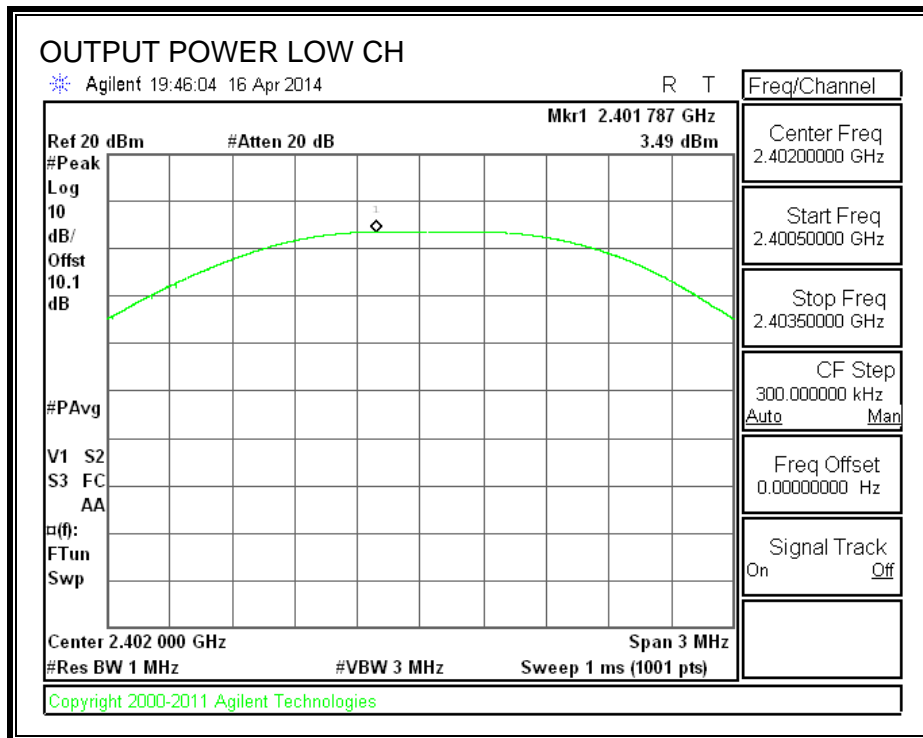
#### TEST PROCEDURE

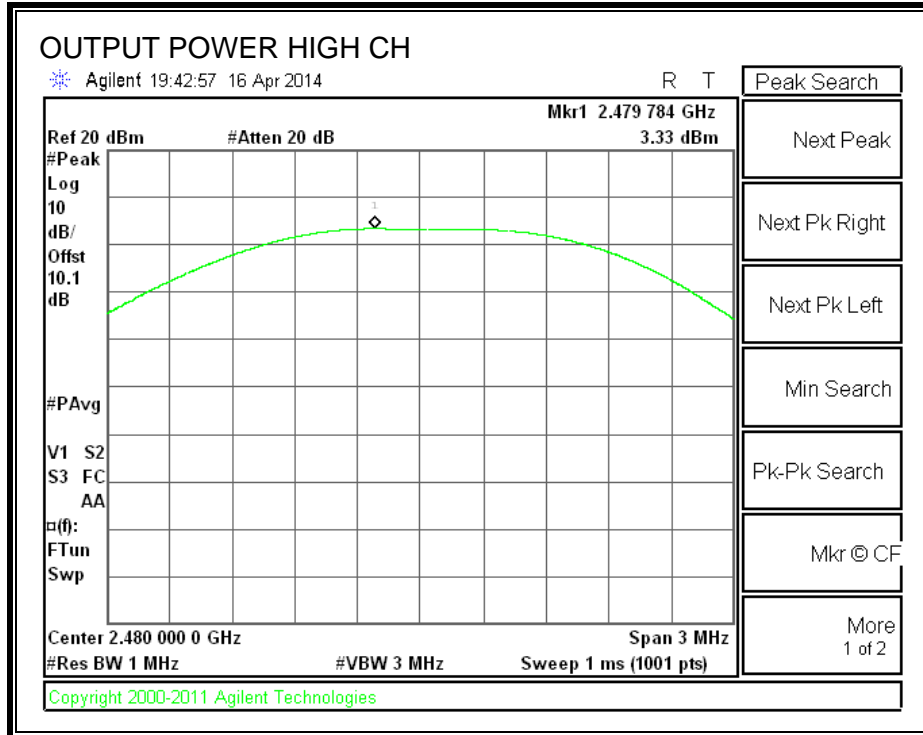
Peak power is measured using KDB558074 D01 DTS Meas Guidance v03r01 April 9, 2013 under section 9.1.1 utilizing spectrum analyzer.

#### RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	3.490	30	-26.510
Middle	2440	4.880	30	-25.120
High	2480	3.330	30	-26.670

**OUTPUT POWER**





## 8.4. AVERAGE POWER

### LIMITS

None; for reporting purposes only.

### TEST PROCEDURE

The transmitter output is connected to a power meter.

### RESULTS

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

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	-0.06
Middle	2440	1.26
High	2480	-0.36

## 8.5. POWER SPECTRAL DENSITY

### LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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.

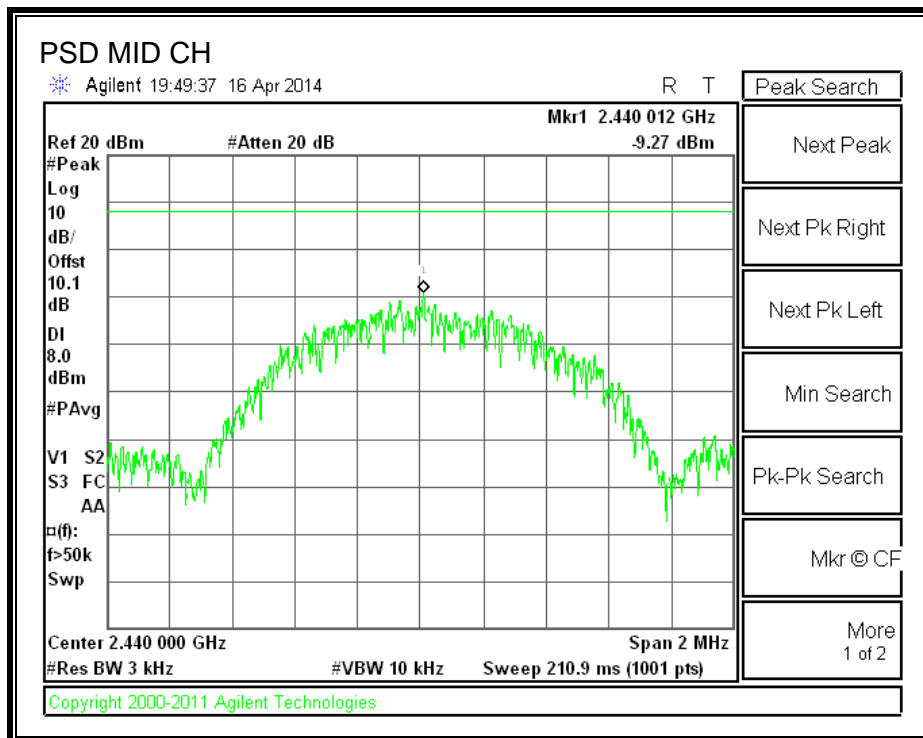
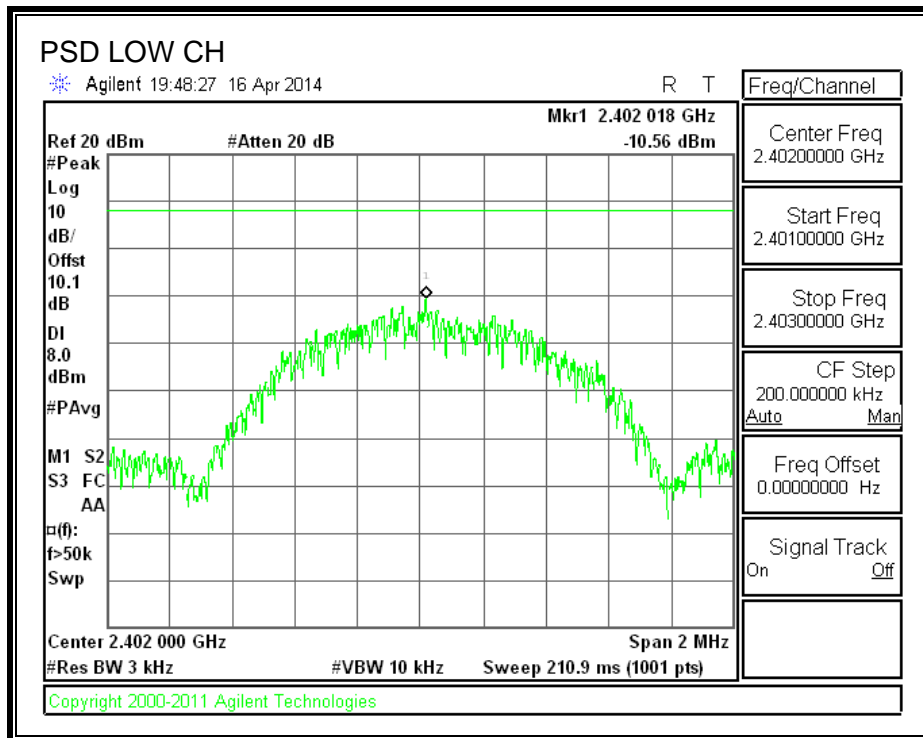
### TEST PROCEDURE

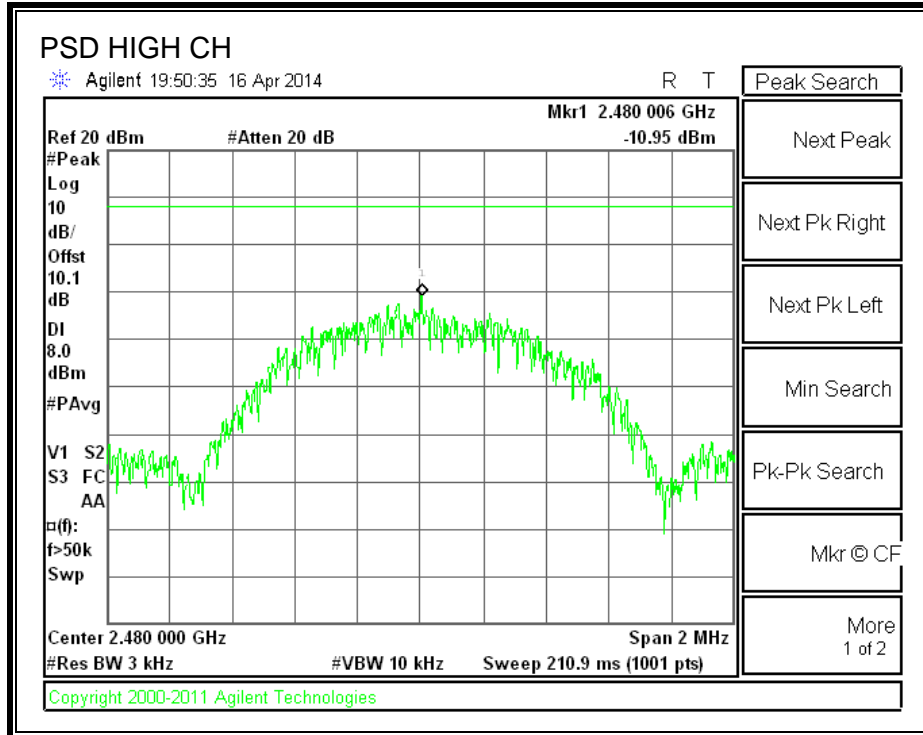
Power Spectral Density was performed utilizing the “Method PKPSD (Peak PSD)” under KDB558074 D01 DTS Meas Guidance v03r01, April 9, 2013

### RESULTS

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-10.56	8	-18.56
Middle	2440	-9.27	8	-17.27
High	2480	-10.95	8	-18.95

**POWER SPECTRAL DENSITY**







## 8.6. CONDUCTED SPURIOUS EMISSIONS

### LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

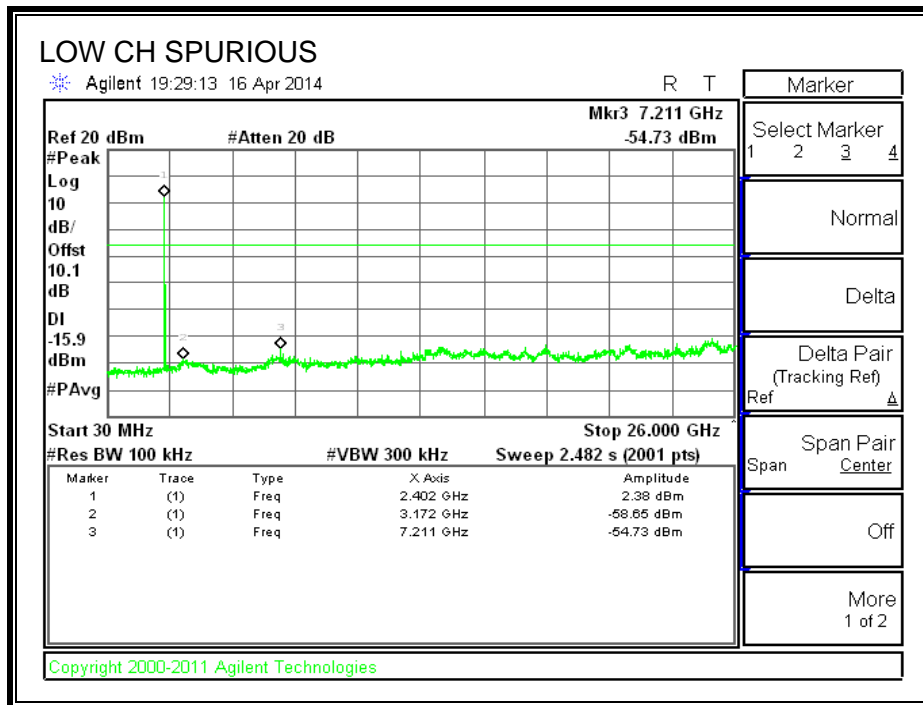
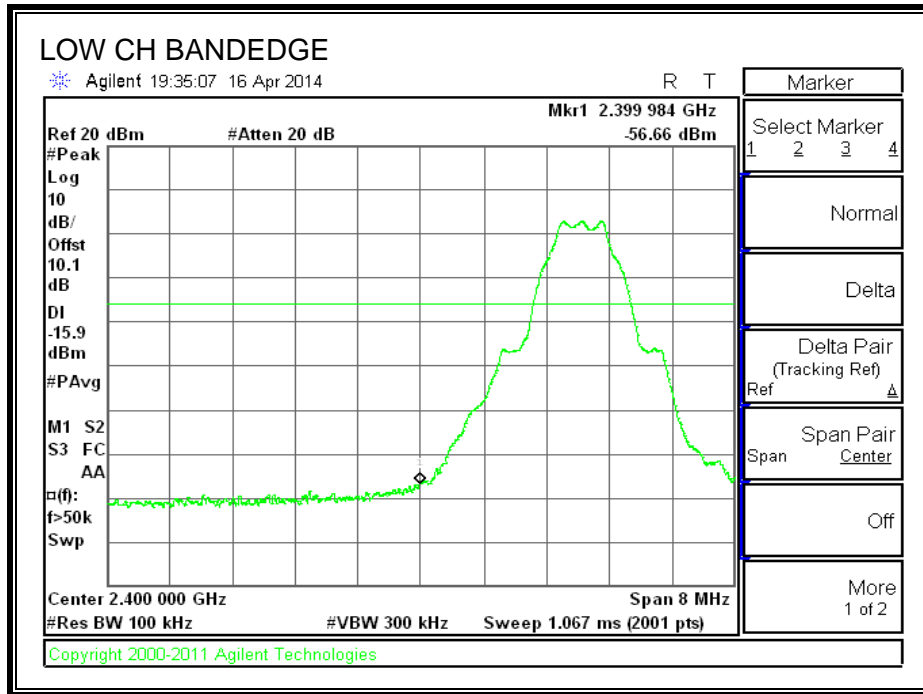
### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

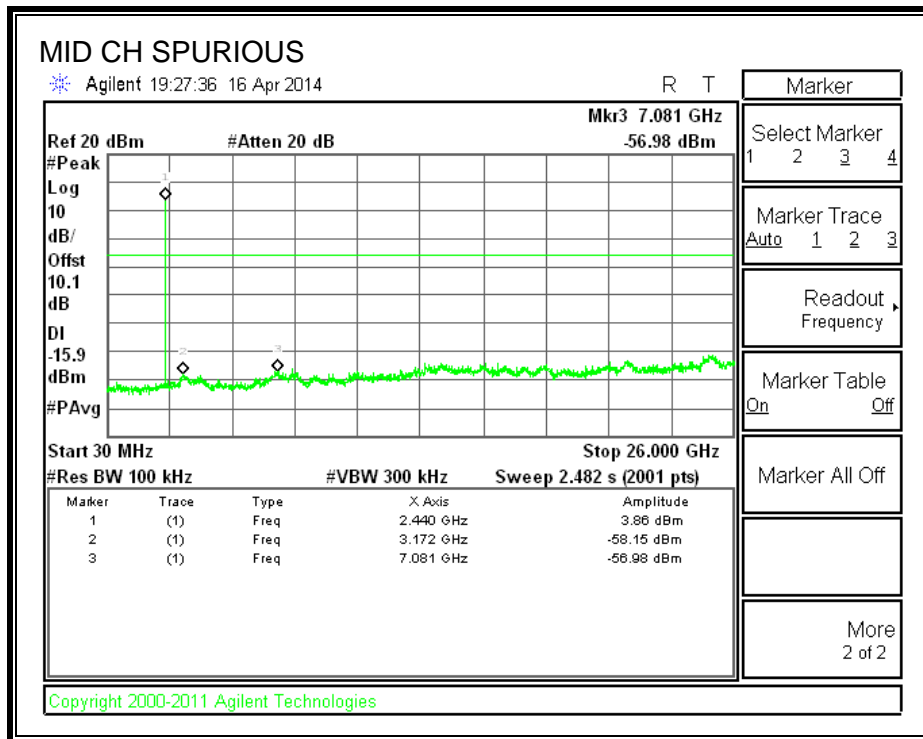
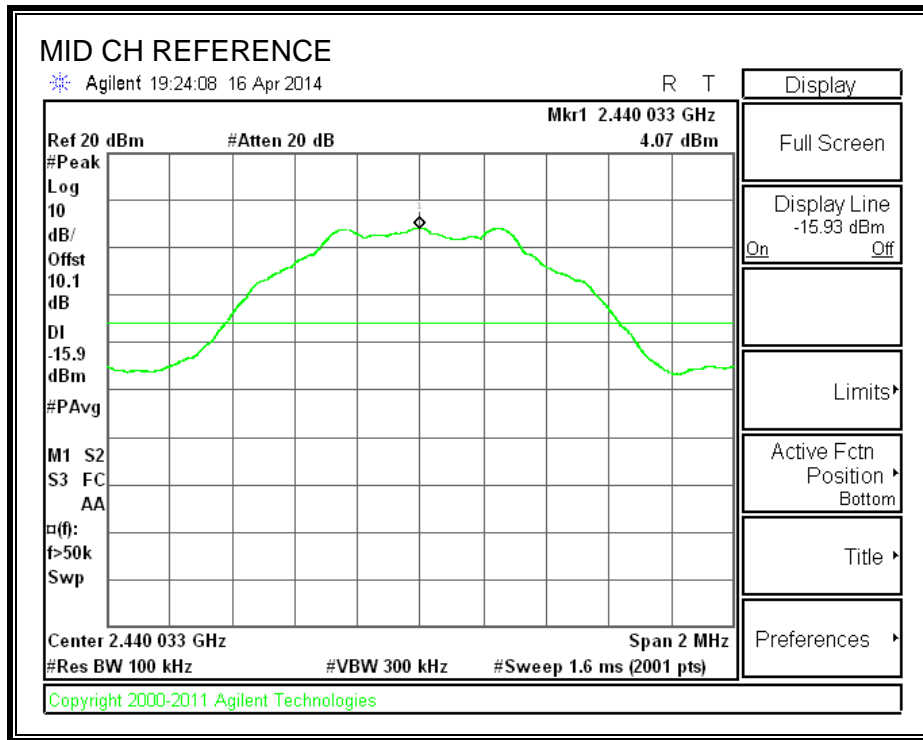
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

**RESULTS**

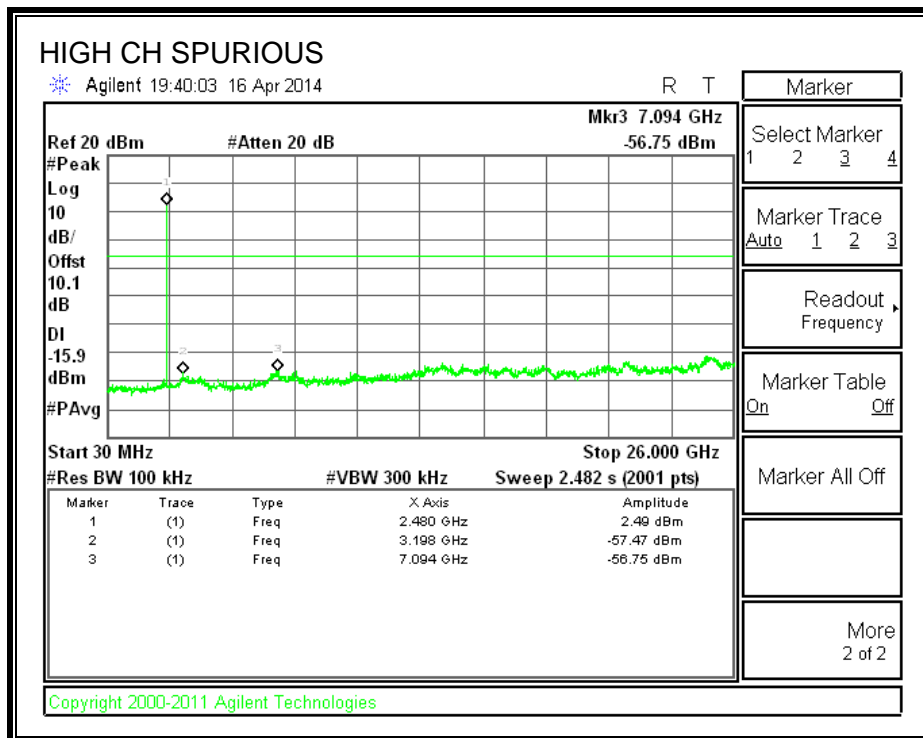
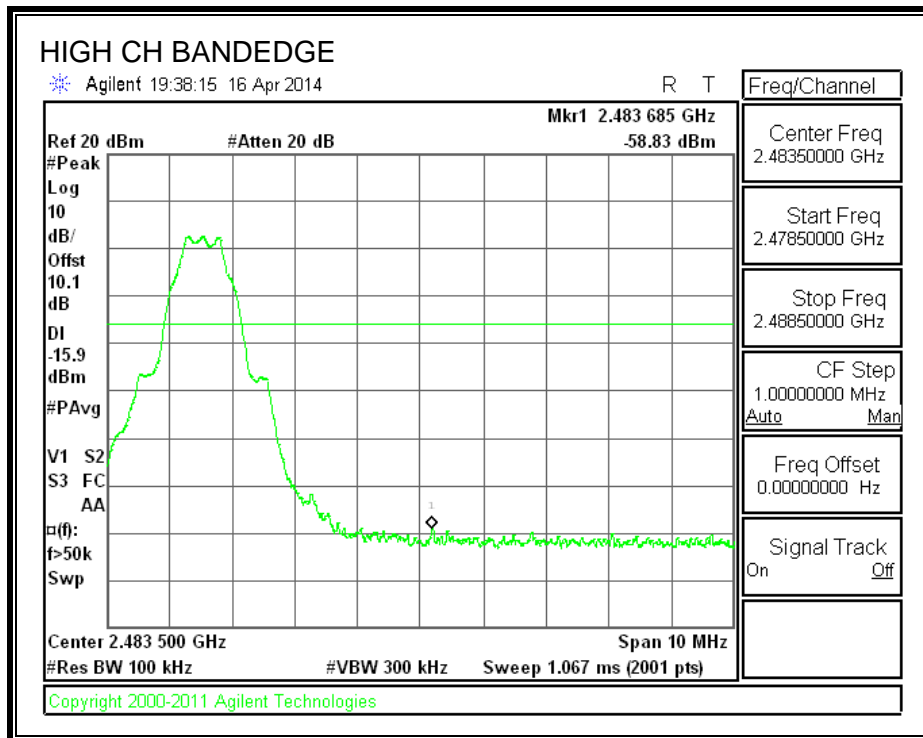
**SPURIOUS EMISSIONS, LOW CHANNEL**



**SPURIOUS EMISSIONS, MID CHANNEL**



**SPURIOUS EMISSIONS, HIGH CHANNEL**



## 9. RADIATED TEST RESULTS

### 9.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4 - 2009. 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 1 MHz for peak measurements and add duty cycle factor for average measurements. Duty cycle factor =  $10 \log(1/x)$ . For this sample: DCF =  $10 \log(1/x) = 2.1 \text{ dB}$

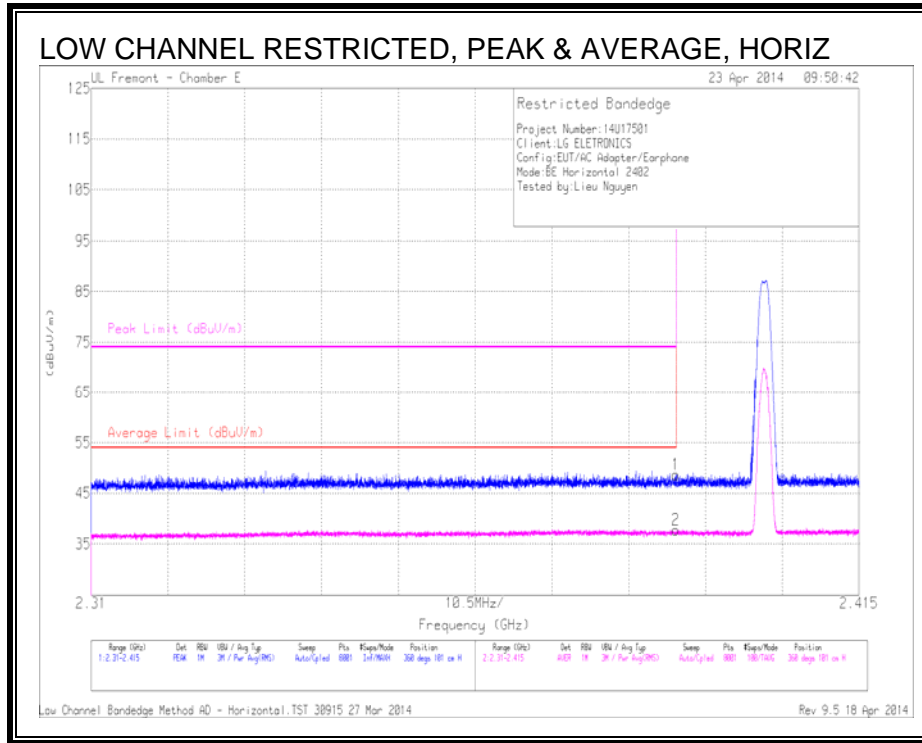
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable 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.

## 9.2. TRANSMITTER ABOVE 1 GHz

### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



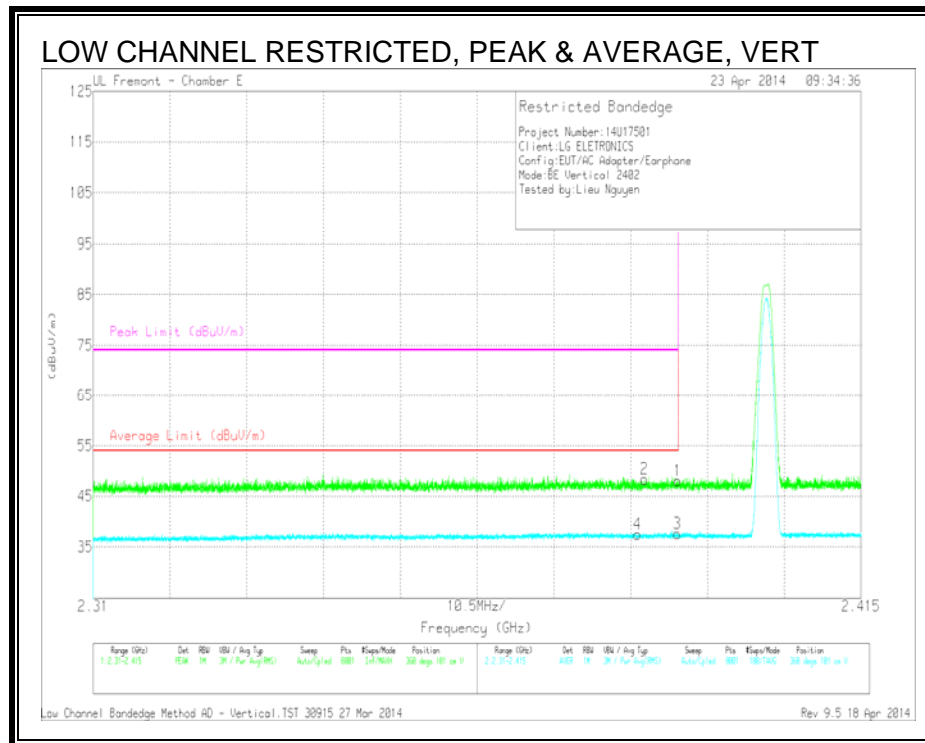
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.4	PK	32	-24.7	48.7	-	-	74	-25.3	360	101	H
2	* 2.39	30.4	RMS	32	-24.7	37.7	54	-16.3	-	-	360	101	H

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



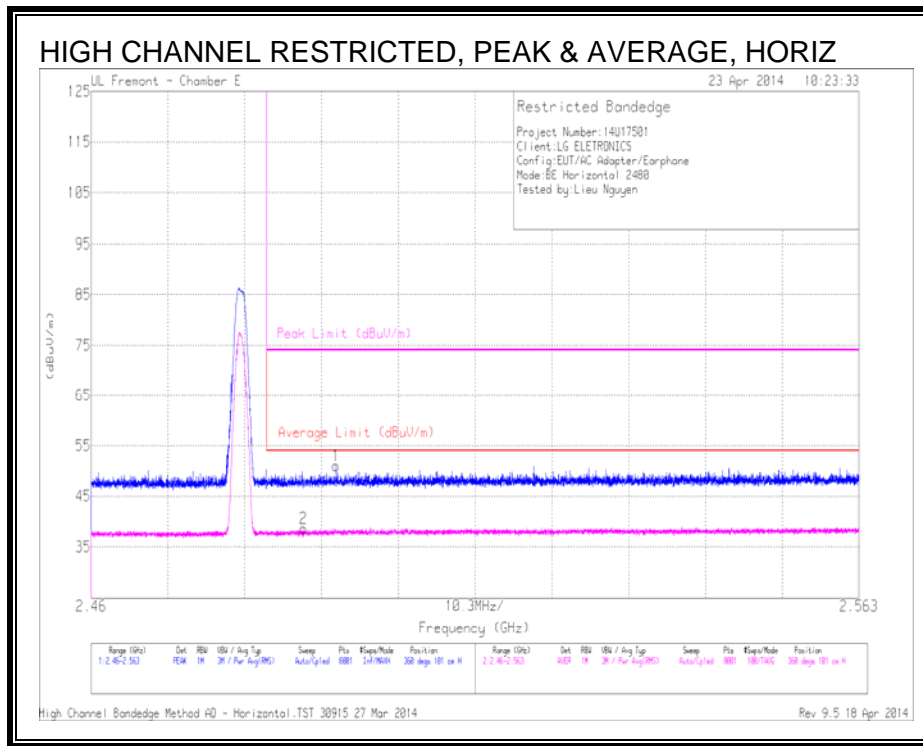
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/ Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.72	PK	32	-24.7	48.02	-	-	74	-25.98	360	101	V
2	* 2.385	41.17	PK	31.9	-24.7	48.37	-	-	74	-25.63	360	101	V
3	* 2.39	30.28	RMS	32	-24.7	37.58	54	-16.42	-	-	360	101	V
4	* 2.384	30.24	RMS	31.9	-24.6	37.54	54	-16.46	-	-	360	101	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Ftr/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	* 2.493	43.09	PK	32.3	-24.3	51.09	-	-	74	-22.91	360	101	H
2	* 2.488	30.62	RMS	32.3	-24.3	38.62	54	-15.38	-	-	360	101	H

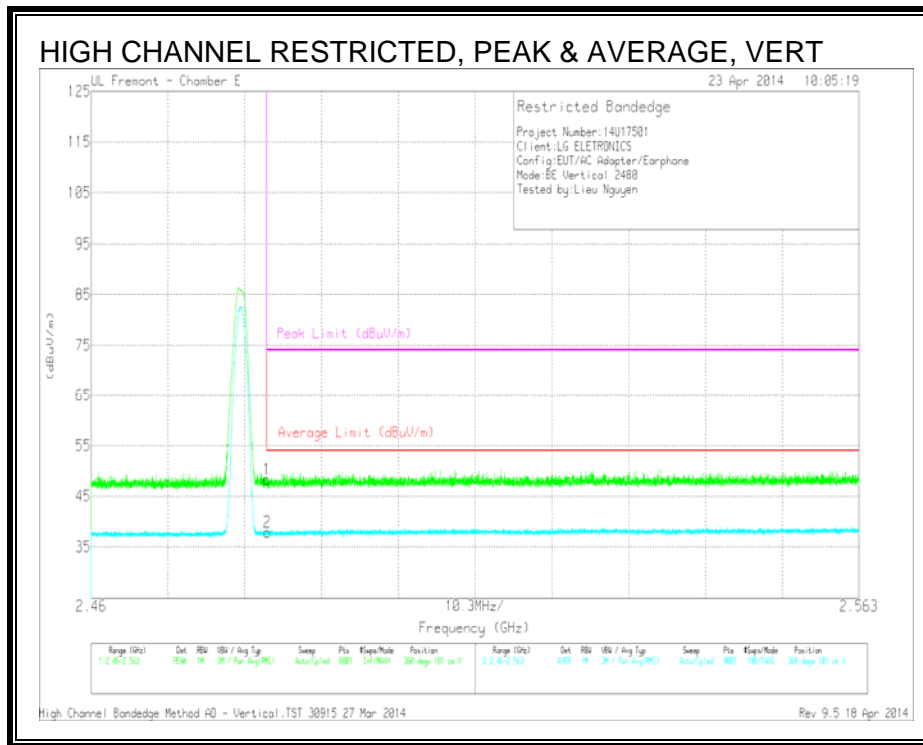
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection



**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Filtr/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	40.32	PK	32.3	-24.3	48.32	-	-	74	-25.68	360	101	V
2	* 2.484	29.92	RMS	32.3	-24.3	37.92	54	-16.08	-	-	360	101	V

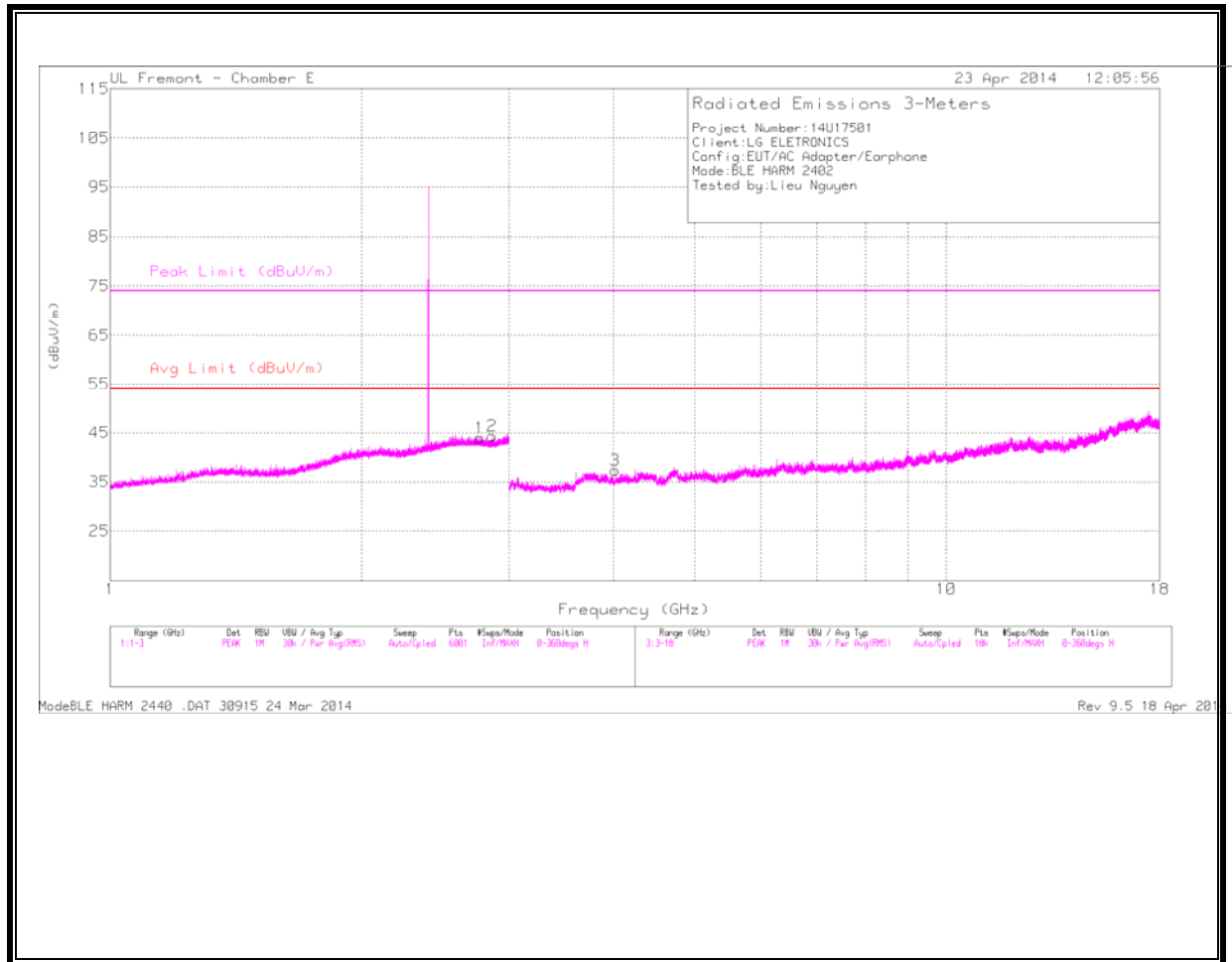
\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

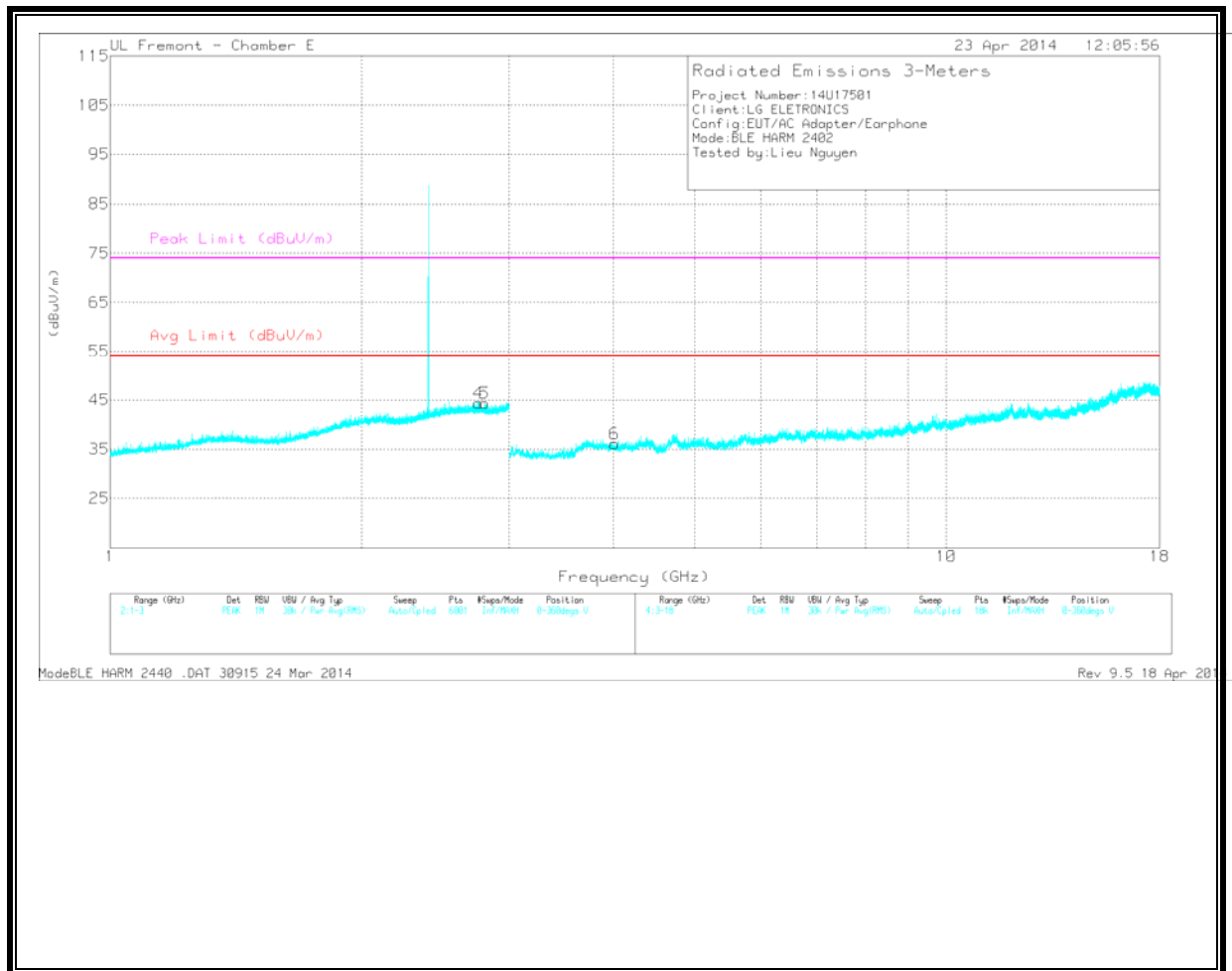
**HARMONICS AND SPURIOUS EMISSIONS**

**LOW CHANNEL  
HORIZONTAL**



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA  
 Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/F ltr/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	* 2.769	35.6	PK	32.4	-24	44	-	-	74	-30	0-360	101	H
2	* 2.864	35.98	PK	32.5	-24.2	44.28	-	-	74	-29.72	0-360	101	H
4	* 2.755	35.82	PK	32.4	-23.9	44.32	-	-	74	-29.68	0-360	200	V
5	* 2.805	36	PK	32.4	-24.1	44.3	-	-	74	-29.7	0-360	200	V
3	* 4.019	34.7	PK	33.4	-30.8	37.3	-	-	74	-36.7	0-360	199	H
6	* 4.008	33.41	PK	33.4	-30.7	36.11	-	-	74	-37.89	0-360	200	V

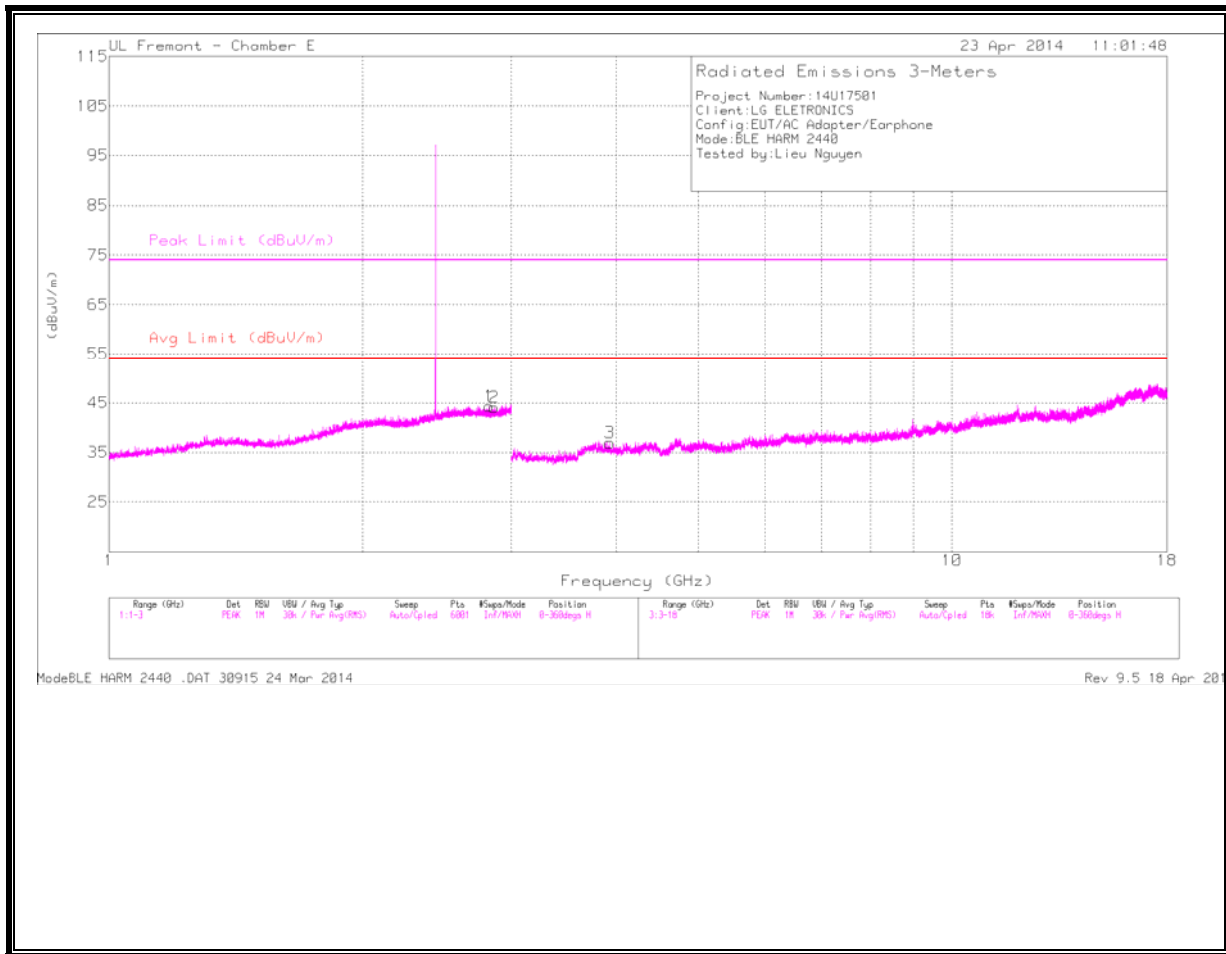
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.766	43.3	PK2	32.4	-24	51.7	-	-	74	-22.3	0	101	H
* 2.861	42.96	PK2	32.5	-24.2	51.26	-	-	74	-22.74	0	101	H
* 2.752	43.82	PK2	32.4	-23.9	52.32	-	-	74	-21.68	0	101	V
* 2.803	42.99	PK2	32.4	-24.1	51.29	-	-	74	-22.71	0	101	V
* 4.021	41.36	PK2	33.4	-30.8	43.96	-	-	74	-30.04	0	101	H
* 4.01	41.16	PK2	33.4	-30.7	43.86	-	-	74	-30.14	0	101	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

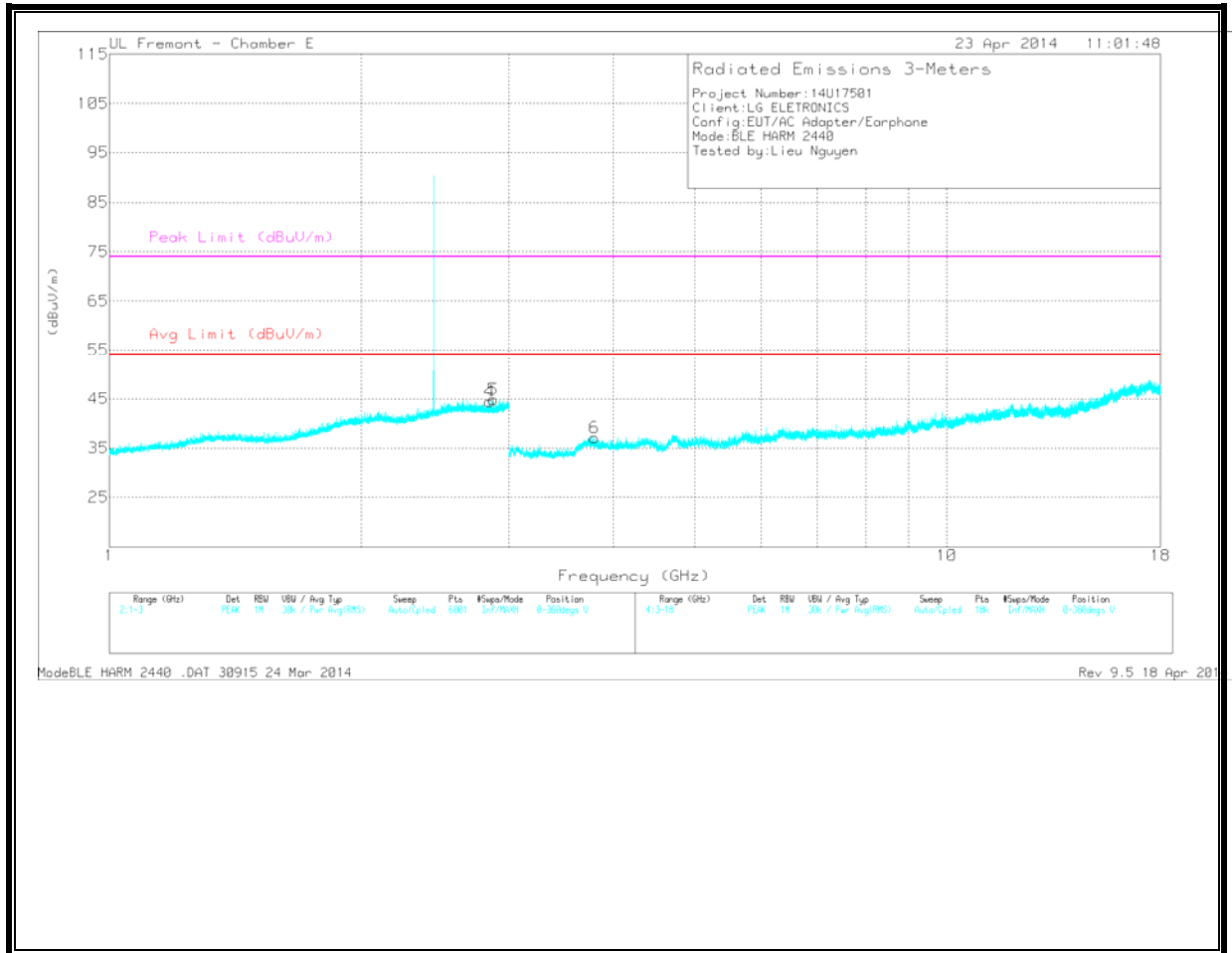
MID CHANNEL

HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

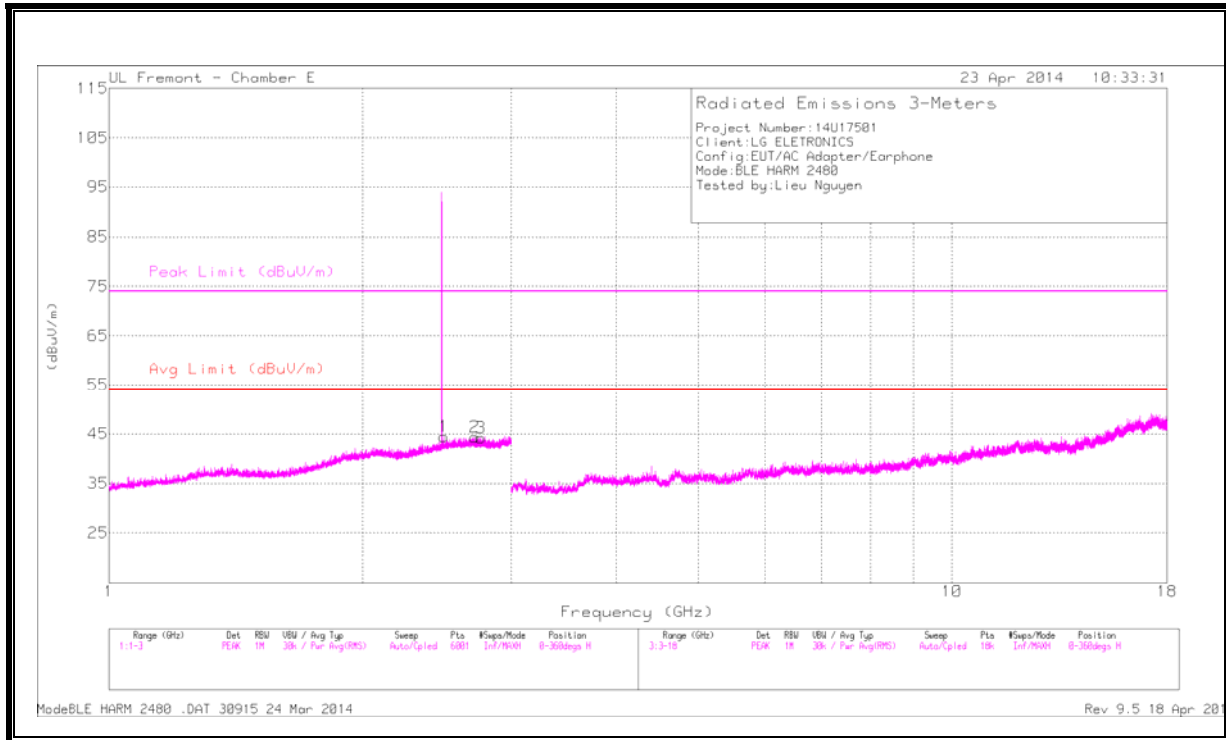
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.824	36.04	PK	32.4	-24.1	44.34	-	-	74	-29.66	0-360	101	H
2	* 2.863	35.76	PK	32.5	-24.2	44.06	-	-	74	-29.94	0-360	199	H
4	* 2.846	36.19	PK	32.4	-24.1	44.49	-	-	74	-29.51	0-360	101	V
5	* 2.874	36.39	PK	32.5	-24.1	44.79	-	-	74	-29.21	0-360	101	V
3	* 3.926	34.91	PK	33.5	-31.5	36.91	-	-	74	-37.09	0-360	101	H
6	* 3.796	35.01	PK	33.4	-31.3	37.11	-	-	74	-36.89	0-360	200	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.825	43.3	PK2	32.4	-24.1	51.6	-	-	74	-22.4	0	101	H
* 2.865	44.15	PK2	32.5	-24.2	52.45	-	-	74	-21.55	0	101	H
* 2.843	43.69	PK2	32.4	-24.2	51.89	-	-	74	-22.11	0	101	V
* 2.877	43.03	PK2	32.5	-24.1	51.43	-	-	74	-22.57	0	101	V
* 3.926	42.45	PK2	33.5	-31.5	44.45	-	-	74	-29.55	0	101	H
* 3.975	41.37	PK2	33.5	-30.9	43.97	-	-	74	-30.03	0	101	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

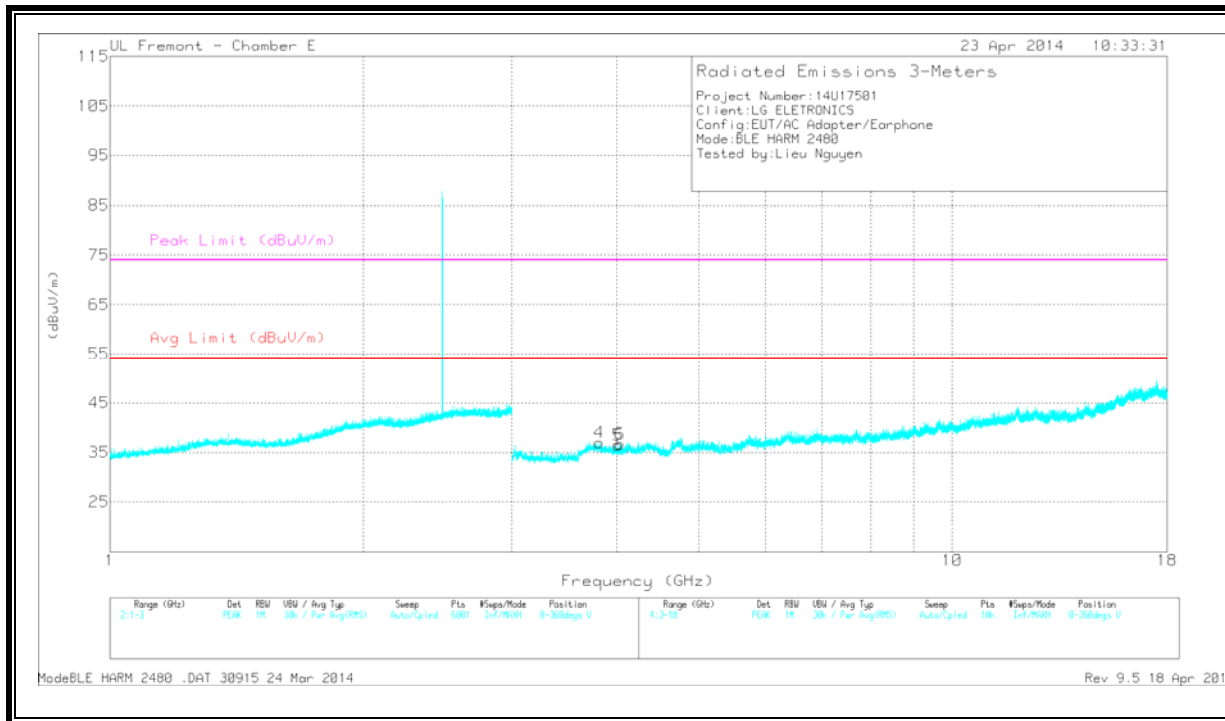
HIGH CHANNEL  
 HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.



VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

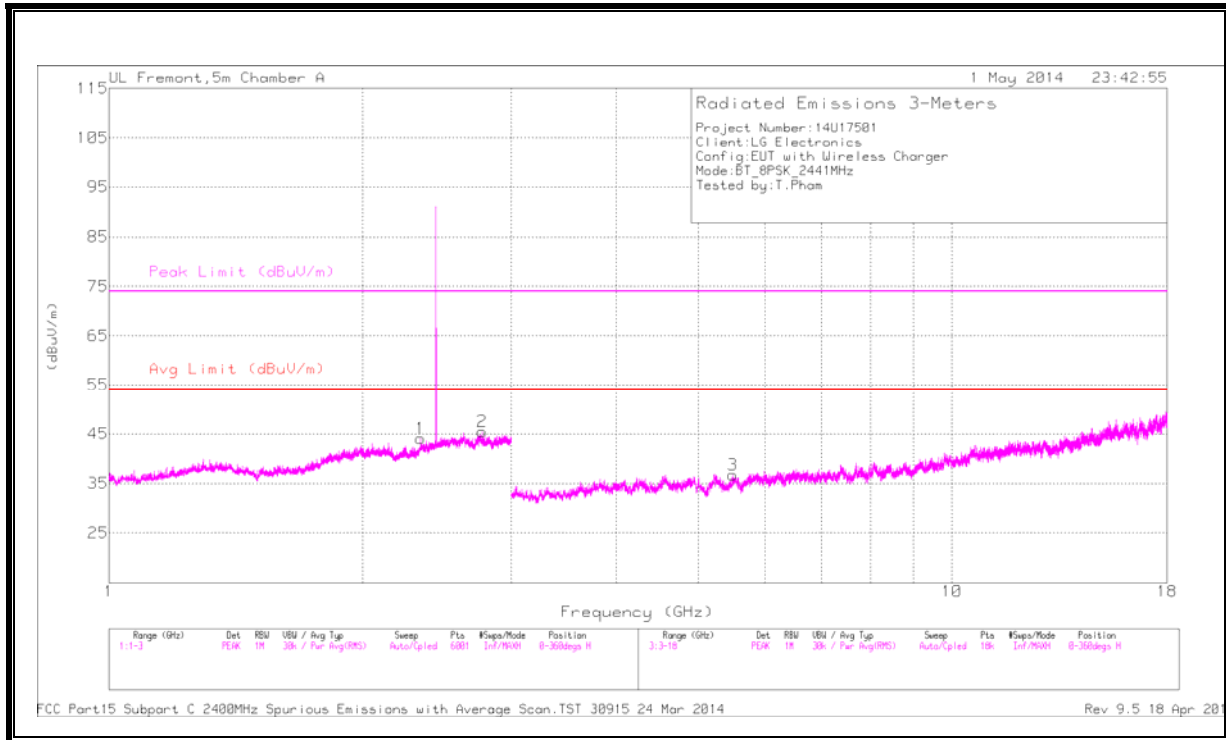
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.496	36.46	PK	32.3	-24.3	44.46	-	-	74	-29.54	0-360	199	H
2	* 2.714	35.73	PK	32.5	-23.9	44.33	-	-	74	-29.67	0-360	199	H
3	* 2.76	35.86	PK	32.4	-24	44.26	-	-	74	-29.74	0-360	199	H
4	* 3.808	34.8	PK	33.4	-31.2	37	-	-	74	-37	0-360	101	V
5	* 4.012	33.71	PK	33.4	-30.7	36.41	-	-	74	-37.59	0-360	200	V
6	* 4.034	34.06	PK	33.5	-30.8	36.76	-	-	74	-37.24	0-360	200	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.496	44.02	PK2	32.3	-24.3	52.02	-	-	74	-21.98	0	101	H
* 2.714	43.91	PK2	32.5	-23.9	52.51	-	-	74	-21.49	0	101	H
* 2.76	43.5	PK2	32.4	-24	51.9	-	-	74	-22.1	0	101	H
* 4.01	41.16	PK2	33.4	-30.7	43.86	-	-	74	-30.14	0	101	V
* 3.808	42.55	PK2	33.4	-31.2	44.75	-	-	74	-29.25	0	101	V
* 4.012	41.91	PK2	33.4	-30.7	44.61	-	-	74	-29.39	0	101	V
* 4.034	41.77	PK2	33.5	-30.8	44.47	-	-	74	-29.53	0	101	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

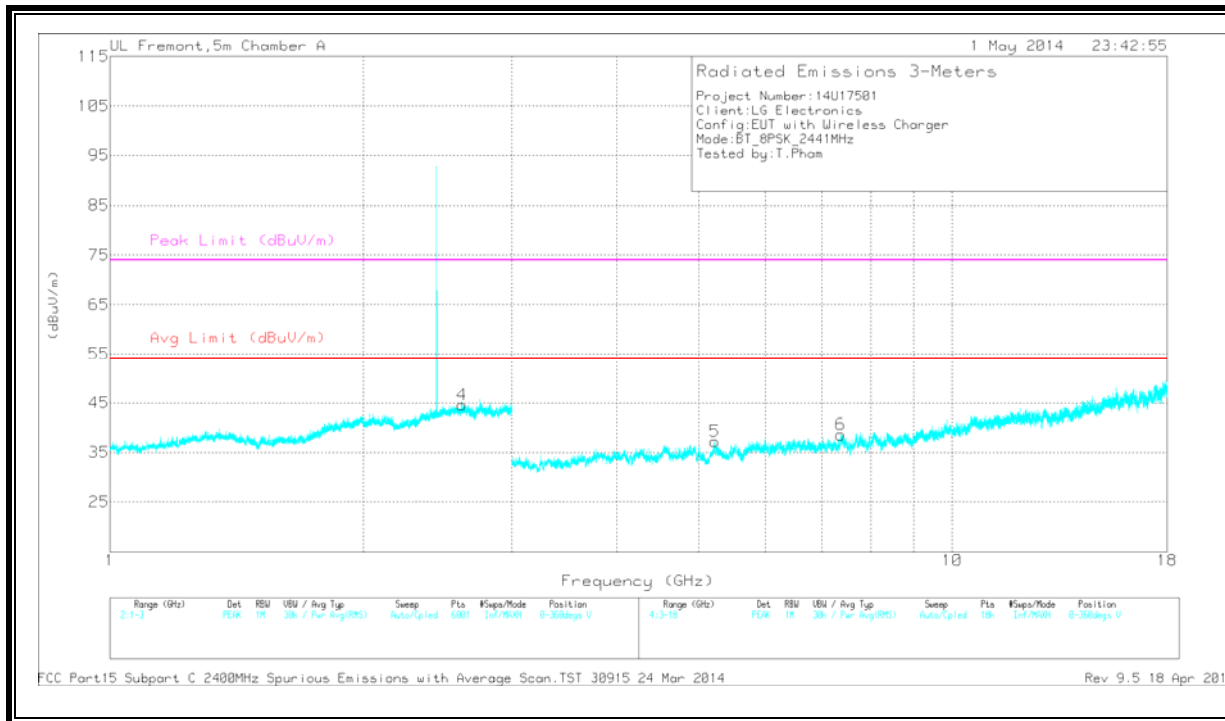
PK2 - KDB558074 Method: Maximum Peak

WORST CASE WITH WPC CHARGER AND COVER  
 HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Filtr/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	* 2.344	36.08	PK	31.8	-23.8	44.08	-	-	74	-29.92	0-360	200	H
2	* 2.77	35.53	PK	32.7	-22.7	45.53	-	-	74	-28.47	0-360	200	H
6	* 7.378	27.66	PK	35.3	-24.4	38.56	-	-	74	-35.44	0-360	200	V
4	2.619	34.9	PK	32.9	-23.2	44.6	-	-	-	-	0-360	200	V
5	5.227	30.63	PK	34.2	-27.6	37.23	-	-	-	-	0-360	200	V
3	5.491	31.65	PK	34.4	-29.3	36.75	-	-	-	-	0-360	200	H

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

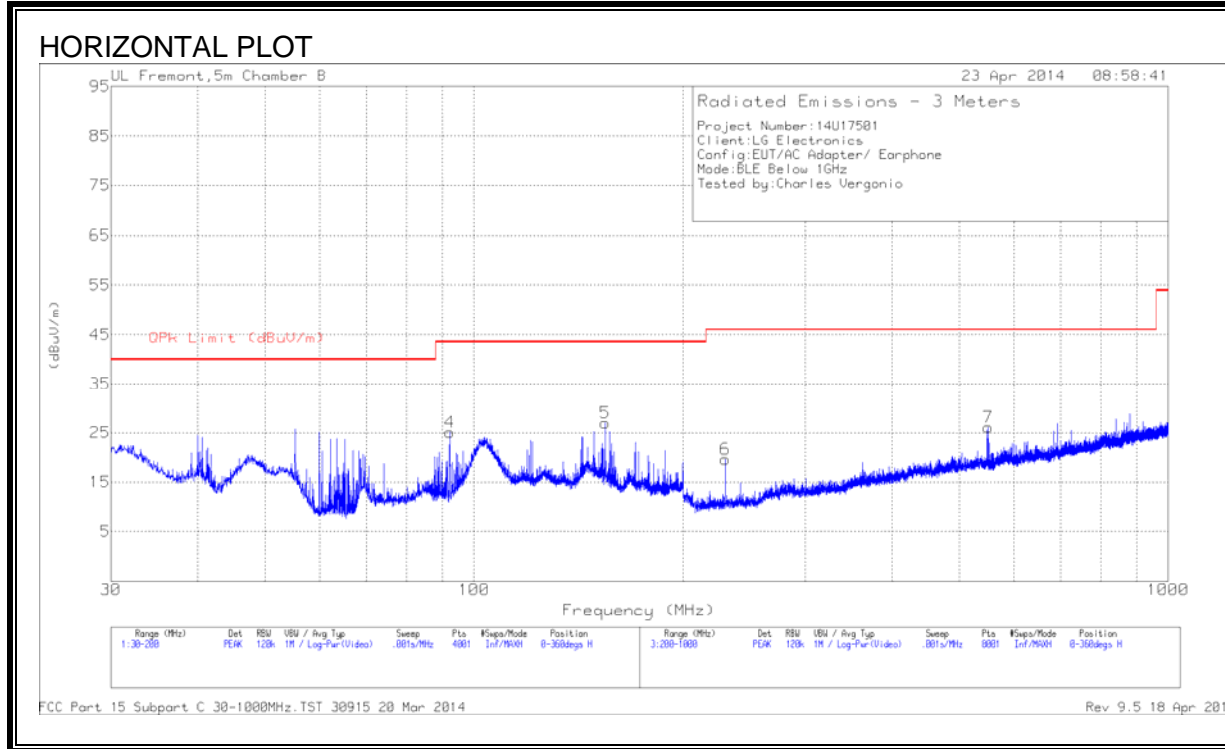
PK - Peak detector  
 Radiated Emissions

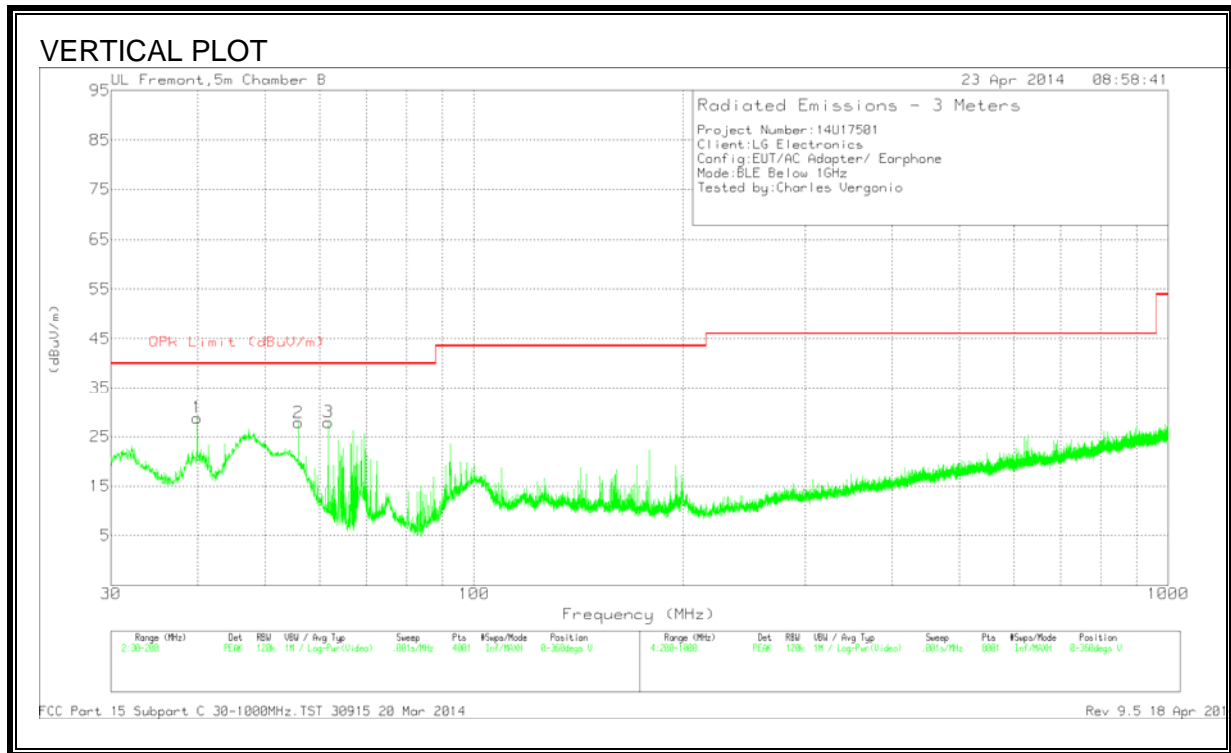
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.345	42.96	PK3	31.9	-23.8	51.06	-	-	74	-22.94	359	100	H
* 2.768	42.47	PK3	32.7	-22.7	52.47	-	-	74	-21.53	359	100	H
* 7.377	35.68	PK3	35.3	-24.4	46.58	-	-	74	-27.42	359	100	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

# WORST-CASE BELOW 1 GHz

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





Trace Markers

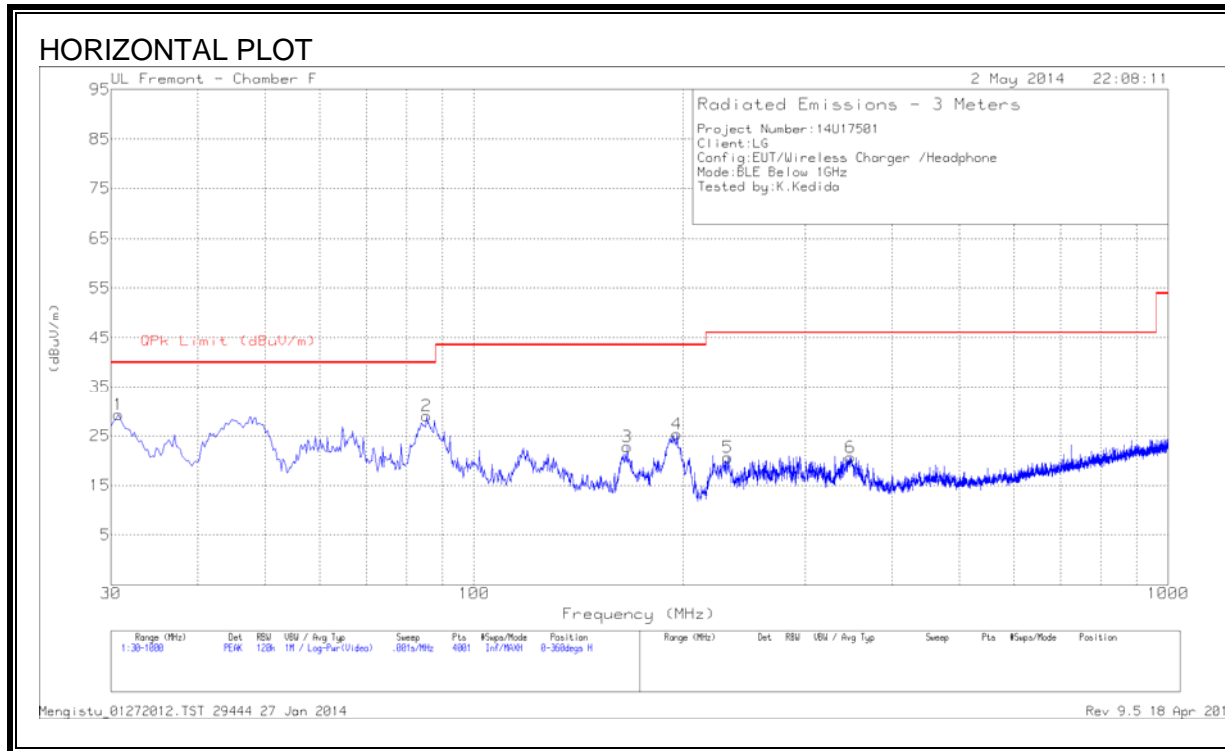
Marker	Frequency (MHz)	Meter Reading (dBUV)	Det	AF T477 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBUV/m)	QPk Limit (dBUV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	39.945	43.94	PK	13.6	-28.7	28.84	40	-11.16	0-360	101	V
2	55.84	49.45	PK	7	-28.6	27.85	40	-12.15	0-360	101	V
3	61.6625	48.95	PK	7.5	-28.5	27.95	40	-12.05	0-360	101	V
4	92.2625	44.95	PK	8.2	-28.1	25.05	43.52	-18.47	0-360	300	H
5	154.61	42.24	PK	12.2	-27.5	26.94	43.52	-16.58	0-360	101	H
6	230.2	35.18	PK	11	-26.6	19.58	46.02	-26.44	0-360	200	H
7	550	33.97	PK	17.7	-25.6	26.07	46.02	-19.95	0-360	200	H

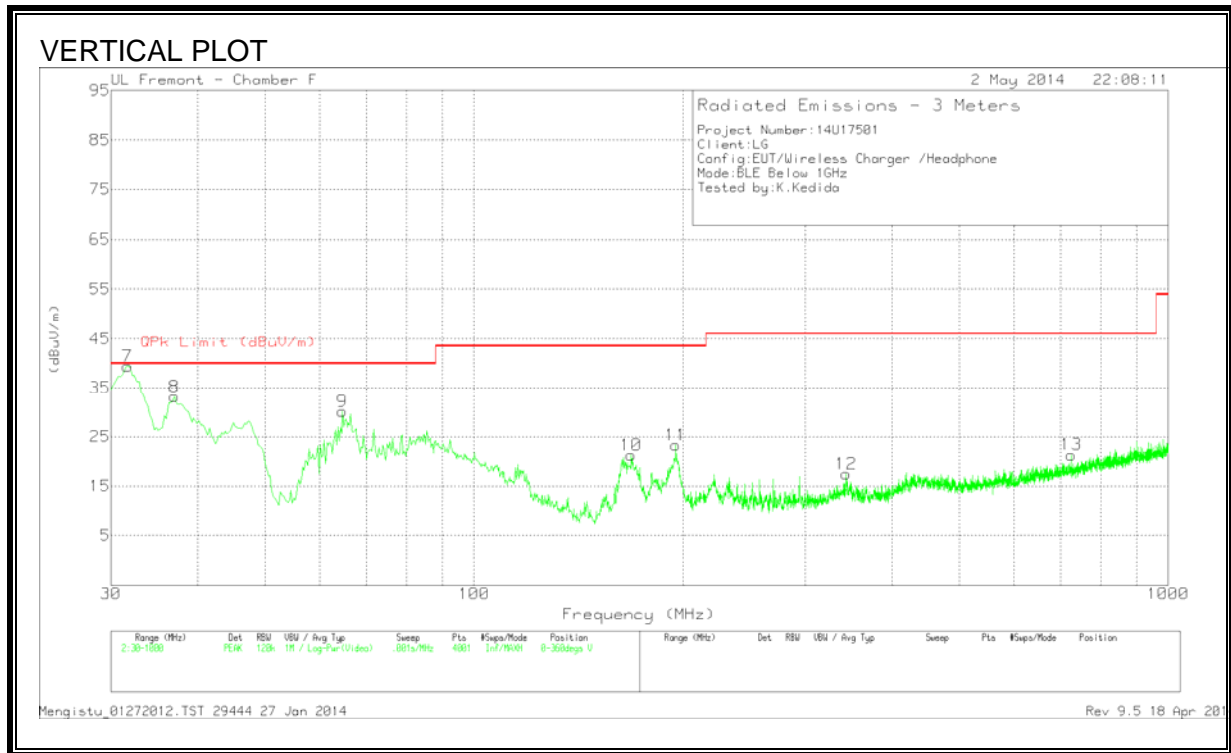
PK - Peak detector



## WORST-CASE WITH WPC CHARGER AND COVER BELOW 1 GHz

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





Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T122 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.7275	40.3	PK	20.8	-31.8	29.3	40	-10.7	0-360	300	H
2	85.5325	52.88	PK	7.4	-31.3	28.98	40	-11.02	0-360	400	H
3	* 166.285	41.76	PK	12.1	-31.1	22.76	43.52	-20.76	0-360	100	H
4	196.112 5	44.39	PK	12.1	-31.1	25.39	43.52	-18.13	0-360	201	H
5	232.002 5	40.27	PK	11.2	-30.8	20.67	46.02	-25.35	0-360	100	H
6	348.645	36.98	PK	14.2	-30.5	20.68	46.02	-25.34	0-360	100	H
7	31.6975	51.16	PK	20.1	-31.8	39.46	40	-.54	0-360	100	V
8	37.0325	49.37	PK	16.1	-32.2	33.27	40	-6.73	0-360	100	V
9	64.6775	53.05	PK	7.9	-30.8	30.15	40	-9.85	0-360	100	V
10	* 168.467 5	40.73	PK	12	-31.4	21.33	43.52	-22.19	0-360	100	V
11	195.385	42.52	PK	12	-31.2	23.32	43.52	-20.2	0-360	100	V
12	343.795	33.73	PK	14.1	-30.3	17.53	46.02	-28.49	0-360	100	V
13	725.49	30.15	PK	20.5	-29.3	21.35	46.02	-24.67	0-360	100	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band  
 PK - Peak detector

## 10. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	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

ANSI C63.4 - 2009

### RESULTS

**6 WORST EMISSIONS**

Line-L1 .15 - 30MHz

**Trace Markers**

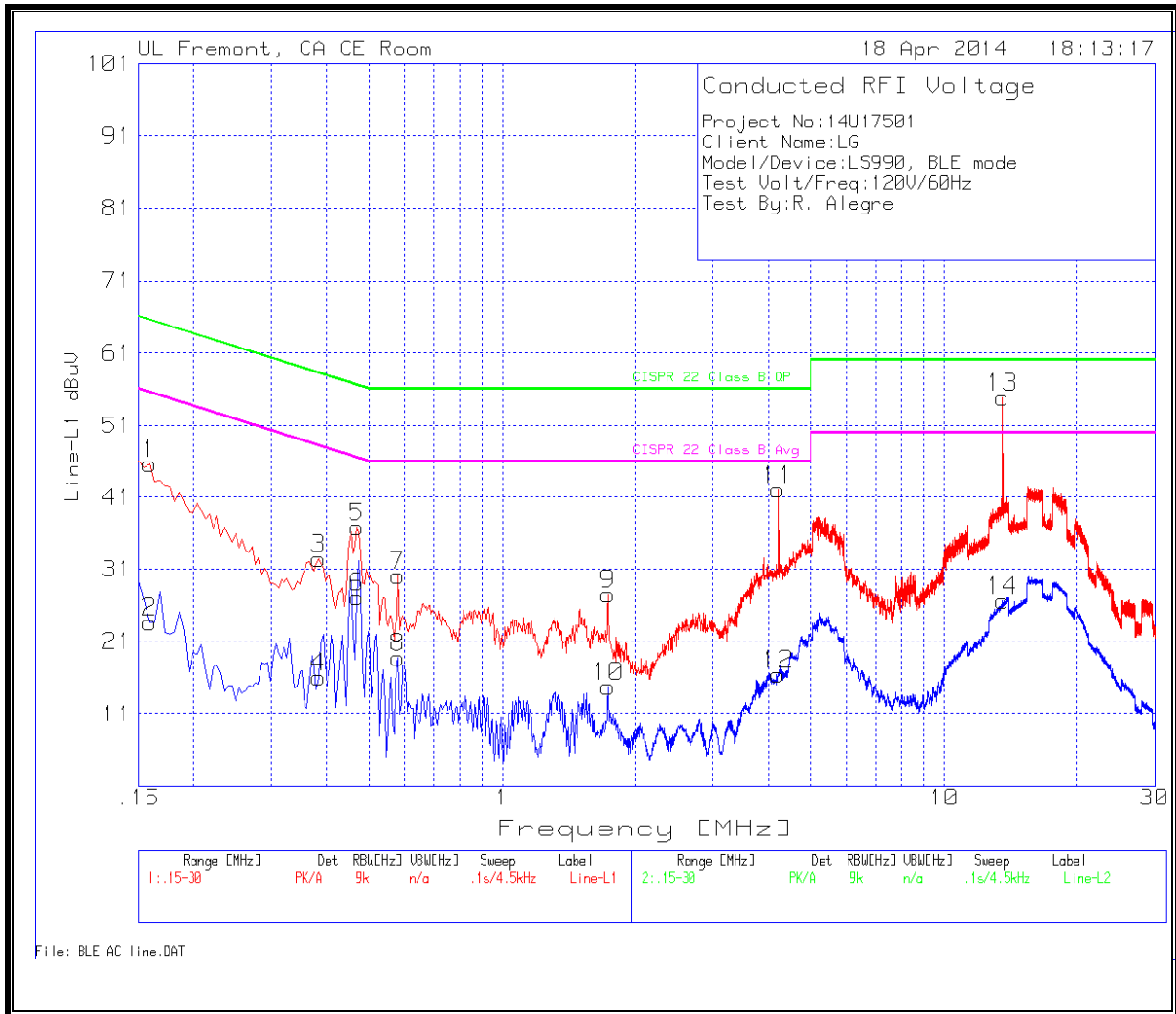
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.159	44.4	PK	1.3	0	45.7	65.5	-19.8	-	-
2	.159	22.37	Av	1.3	0	23.67	-	-	55.5	-31.83
3	.384	31.97	PK	.4	0	32.37	58.2	-25.83	-	-
4	.384	15.67	Av	.4	0	16.07	-	-	48.2	-32.13
5	.4695	36.39	PK	.4	0	36.79	56.5	-19.71	-	-
6	.4695	26.69	Av	.4	0	27.09	-	-	46.5	-19.41
7	.582	29.79	PK	.3	0	30.09	56	-25.91	-	-
8	.582	18.49	Av	.3	0	18.79	-	-	46	-27.21
9	1.734	27.16	PK	.2	.1	27.46	56	-28.54	-	-
10	1.734	14.49	Av	.2	.1	14.79	-	-	46	-31.21
11	4.218	41.75	PK	.2	.1	42.05	56	-13.95	-	-
12	4.218	16.17	Av	.2	.1	16.47	-	-	46	-29.53
13	13.56	54.47	PK	.2	.2	54.87	60	-5.13	-	-
14	13.56	26.25	Av	.2	.2	26.65	-	-	50	-23.35

Line-L2 .15 - 30MHz

**Trace Markers**

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
15	.177	44.7	PK	1.2	0	45.9	64.6	-18.7	-	-
16	.177	30.77	Av	1.2	0	31.97	-	-	54.6	-22.63
17	.3255	38.8	PK	.5	0	39.3	59.6	-20.3	-	-
18	.3255	20.59	Av	.5	0	21.09	-	-	49.6	-28.51
19	.429	39.02	PK	.4	0	39.42	57.3	-17.88	-	-
20	.429	25.1	Av	.4	0	25.5	-	-	47.3	-21.8
21	.51	31.09	PK	.4	0	31.49	56	-24.51	-	-
22	.51	16.95	Av	.4	0	17.35	-	-	46	-28.65
23	1.6125	32.24	PK	.2	.1	32.54	56	-23.46	-	-
24	1.6125	16.49	Av	.2	.1	16.79	-	-	46	-29.21
25	4.9875	36.91	PK	.2	.1	37.21	56	-18.79	-	-
26	4.9875	21.52	Av	.2	.1	21.82	-	-	46	-24.18
27	5.0145	37.21	PK	.2	.1	37.51	60	-22.49	-	-
28	5.0145	21.44	Av	.2	.1	21.74	-	-	50	-28.26
29	13.5555	52.54	PK	.3	.2	53.04	60	-6.96	-	-
30	13.5555	23.39	Av	.3	.2	23.89	-	-	50	-26.11

**LINE 1 RESULTS**



**LINE 2 RESULTS**

