



**FCC CFR47 PART 15 SUBPART C**

**CERTIFICATION TEST REPORT**

**FOR  
LTE Phone Bluetooth and WLAN**

**MODEL NUMBER: LG-MS659  
FCC ID: ZNFMS659**

**REPORT NUMBER: 13U14916-7**

**ISSUE DATE: April 16, 2013**

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

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**NVLAP LAB CODE 200065-0**

Revision History

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|-------------|-------------------|------------------|-------------------|
| --          | 04/01/13          | Initial Issue    |                   |

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** LG ELECTRONICS MOBILECOMM U.S.A., INC.  
1000 SYLVAN AVENUE  
ENGLEWOOD CLIFFS, NEW JERSEY 07632

**EUT DESCRIPTION:** LTE Phone Bluetooth and WLAN

**MODEL:** LG-MS659

**SERIAL NUMBER:** 302KPTM334913

**DATE TESTED:** March 14 – April 16, 2013

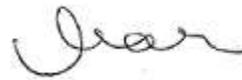
| APPLICABLE STANDARDS     |              |
|--------------------------|--------------|
| STANDARD                 | TEST RESULTS |
| CFR 47 Part 15 Subpart C | Pass         |

UL CCS 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 CCS 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS 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 CCS By:

Tested By:



TIM LEE  
WISE PROGRAM MANAGER  
UL CCS

MONA HUA  
EMC ENGINEER  
UL CCS

## 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 C63.10-2009, RSS-GEN Issue 3, and RSS-210 Issue 8.

## 3. FACILITIES AND ACCREDITATION

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

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.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 1000 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 an LTE Phone with Bluetooth and WLAN capability that is manufactured by LG Electronics.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

| Frequency Range (MHz) | Mode  | Output Power (dBm) | Output Power (mW) |
|-----------------------|-------|--------------------|-------------------|
| 2402 - 2480           | BT LE | 6.90               | 4.90              |

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an INTEGRATED antenna, with a maximum gain of -0.5 dBi.

### 5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was MS795\_LAP8930JR130304.

### 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 Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation with AC adapter and headset.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

| Support Equipment List |              |             |               |        |
|------------------------|--------------|-------------|---------------|--------|
| Description            | Manufacturer | Model       | Serial Number | FCC ID |
| Power Adapter          | LG           | MCS-01WR    | RB310020452   | DoC    |
| Headphones             | Cresyn       | EAB62410801 | NA            | NA     |

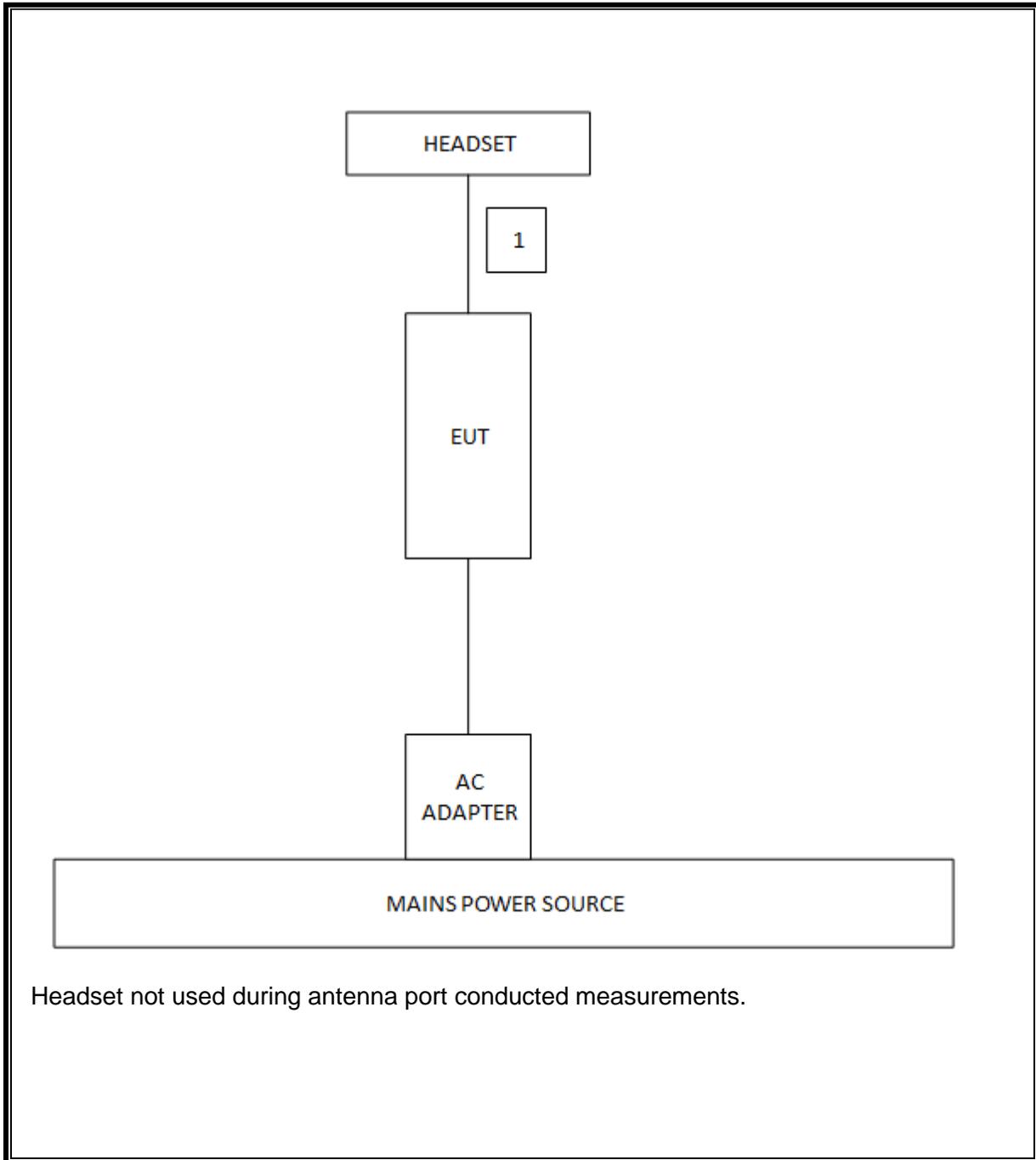
### I/O CABLES

| I/O Cable List |         |                      |                |            |                  |         |
|----------------|---------|----------------------|----------------|------------|------------------|---------|
| Cable No       | Port    | # of identical ports | Connector Type | Cable Type | Cable Length (m) | Remarks |
| 1              | USB     | 1                    | USB            | Shielded   | 1.6m             | N/A     |
| 2              | Headset | 1                    | Audio          | Shielded   | 1.5m             | N/A     |

### TEST SETUP

The EUT is a stand-alone unit that was tested in the worst case orientation and configuration, where applicable, during the tests. Test software exercised the radio.

**SETUP DIAGRAM FOR TESTS**



Headset not used during antenna port conducted measurements.

## 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 Date   | Cal Due    |
| Spectrum Analyzer, 26.5 GHz | Agilent / HP   | E4440A      | C01176 | 12/13/2012 | 12/13/2013 |
| Antenna, Horn, 18 GHz       | ETS            | 3117        | C01022 | 2/21/2013  | 2/21/2014  |
| Preamplifier, 26.5 GHz      | Agilent / HP   | 8449B       | C01052 | 10/22/2012 | 10/22/2013 |
| Preamplifier, 1300 MHz      | Agilent / HP   | 8447D       | C00558 | 02/21/12   | 02/21/14   |
| Power Sensor, 18 GHz        | Agilent / HP   | 8481A       | N02781 | 9/24/2012  | 9/24/2013  |
| Power Meter                 | Agilent / HP   | 437B        | NA     | 8/9/2012   | 8/9/2013   |
| Reject Filter, 2.4-2.5 GHz  | Micro-Tronics  | BRM50702    | N02685 | NA         | CNR        |
| Antenna, Bilog, 30MHz-1 GHz | Sunol Sciences | JB1         | C01011 | 3/6/2013   | 3/6/2014   |
| EMI Test Receiver, 30 MHz   | R & S          | ESHS 20     | N02396 | 08/08/12   | 08/08/13   |
| LISN, 30 MHz                | FCC            | 50/250-25-2 | C00626 | 01/14/13   | 01/14/14   |

## 7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

### LIMITS

None; for reporting purposes only.

### PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

#### 7.1.1. ON TIME AND DUTY CYCLE RESULTS

| Mode<br>2.4GHz | ON Time<br>B<br>(msec) | Period<br>(msec) | Duty Cycle<br>x<br>(linear) | Duty<br>Cycle<br>(%) | Duty Cycle<br>Correction Factor<br>(dB) | 1/B<br>Minimum VBW<br>(kHz) |
|----------------|------------------------|------------------|-----------------------------|----------------------|---|-----------------------------|
| BLE            | 0.10                   | 1                | 0.162                       | 16.2%                | 7.90                                    | 9.872                       |

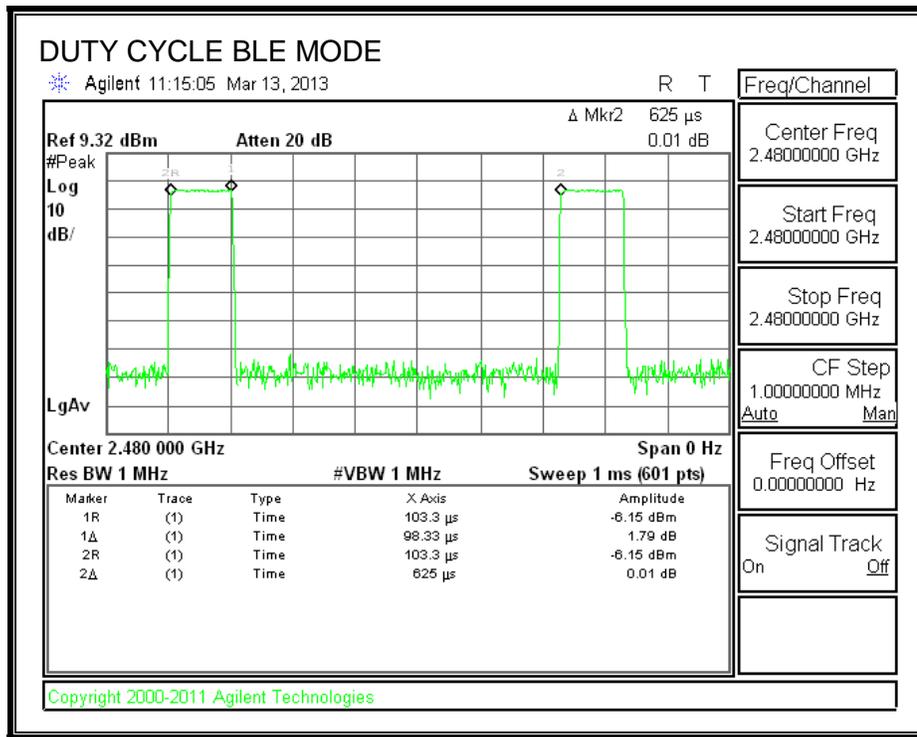
#### 7.1.2. MEASUREMENT METHOD FOR POWER AND PPSD

The Duty Cycle is less than 98% and consistent therefore KDB 789033 Method SA-2 is used.

#### 7.1.3. MEASUREMENT METHOD FOR AVERAGE SPURIOUS EMISSIONS ABOVE 1 GHz

The Duty Cycle is less than 98% and consistent, KDB 789033 Method AD with Power RMS Averaging and duty cycle correction is used.

### 7.1.4. DUTY CYCLE PLOTS



## 8. ANTENNA PORT TEST RESULTS – LE (LOW ENERGY) MODULATION

### 8.1.1. 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.

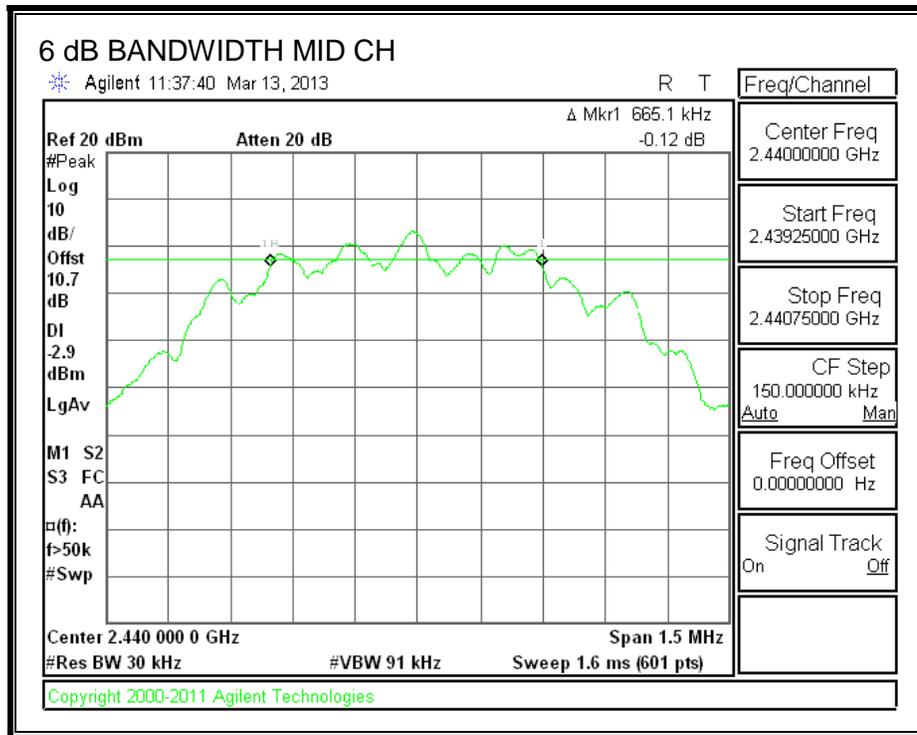
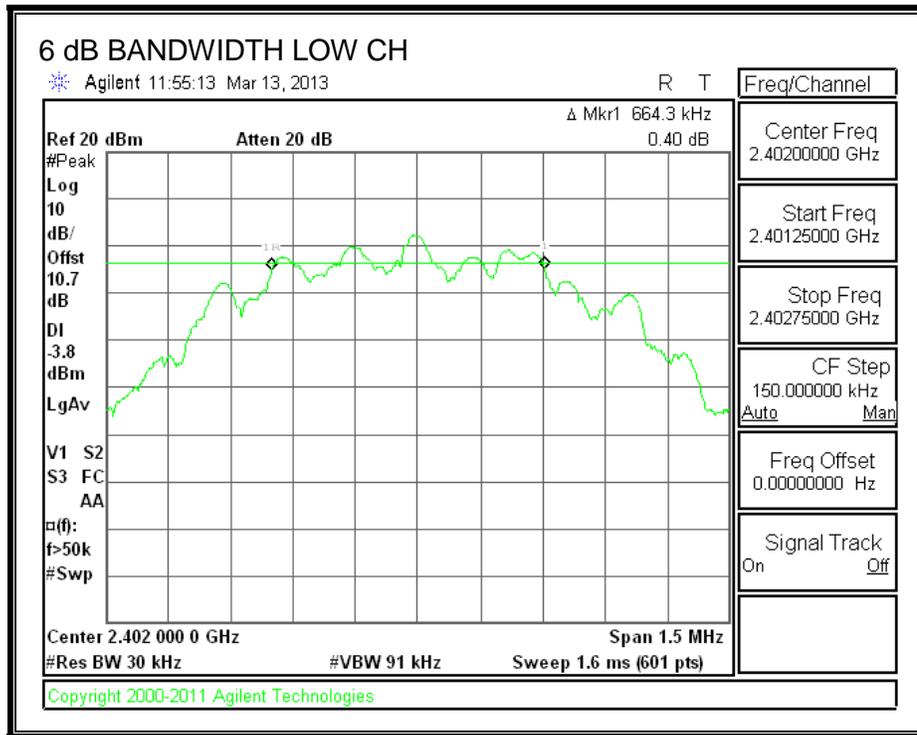
#### TEST PROCEDURE

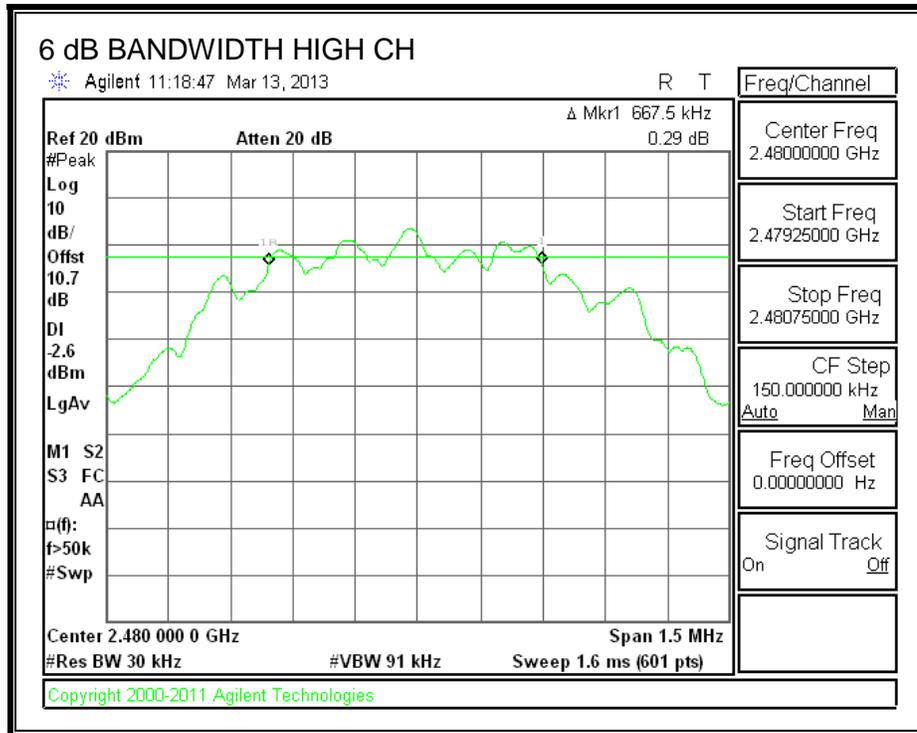
The transmitter output is connected to a spectrum analyzer with the RBW set between 1% and 5% of the EBW, the VBW  $\geq 3 \times$  RBW, peak detector and max hold.

#### RESULTS

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---------|-----------------|----------------------|---------------------|
| Low     | 2402            | 0.6643               | 0.5                 |
| Mid     | 2440            | 0.6651               | 0.5                 |
| High    | 2480            | 0.6675               | 0.5                 |

**6 dB BANDWIDTH**





### 8.1.2. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

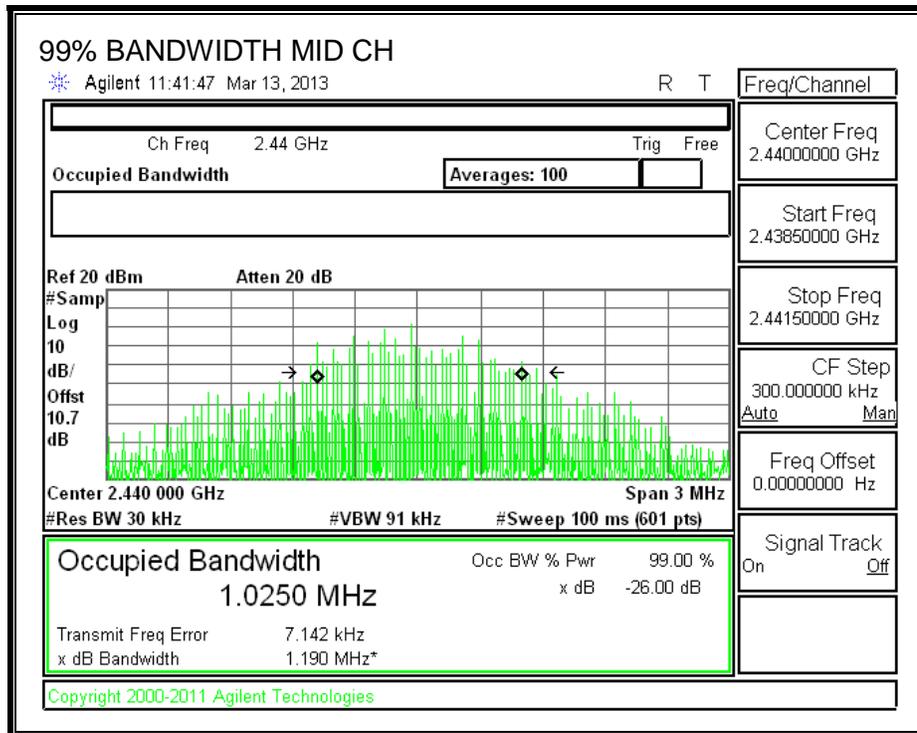
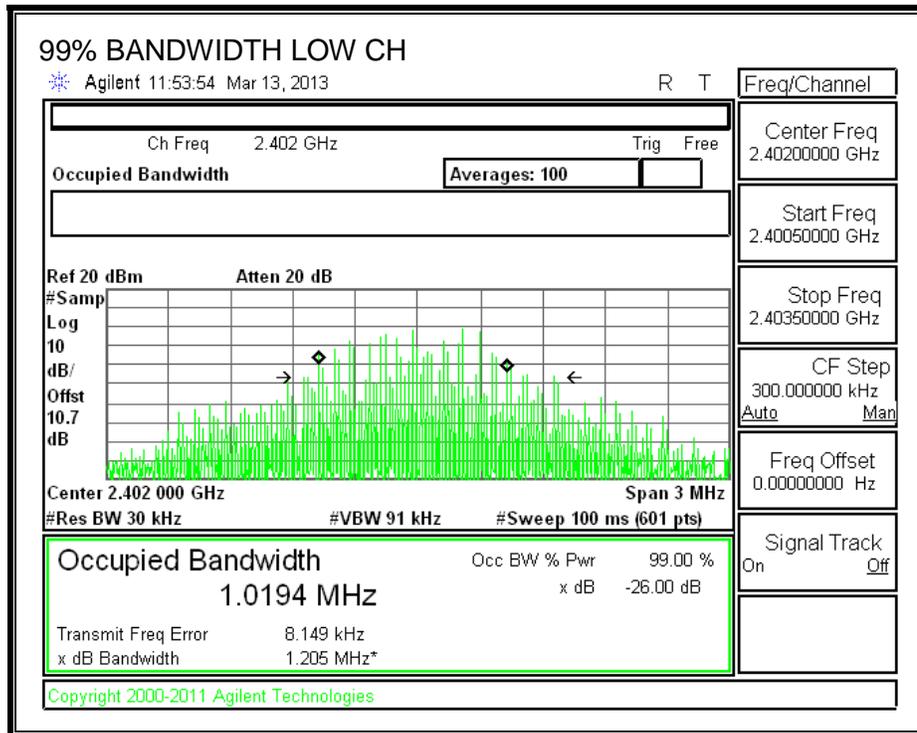
#### TEST PROCEDURE

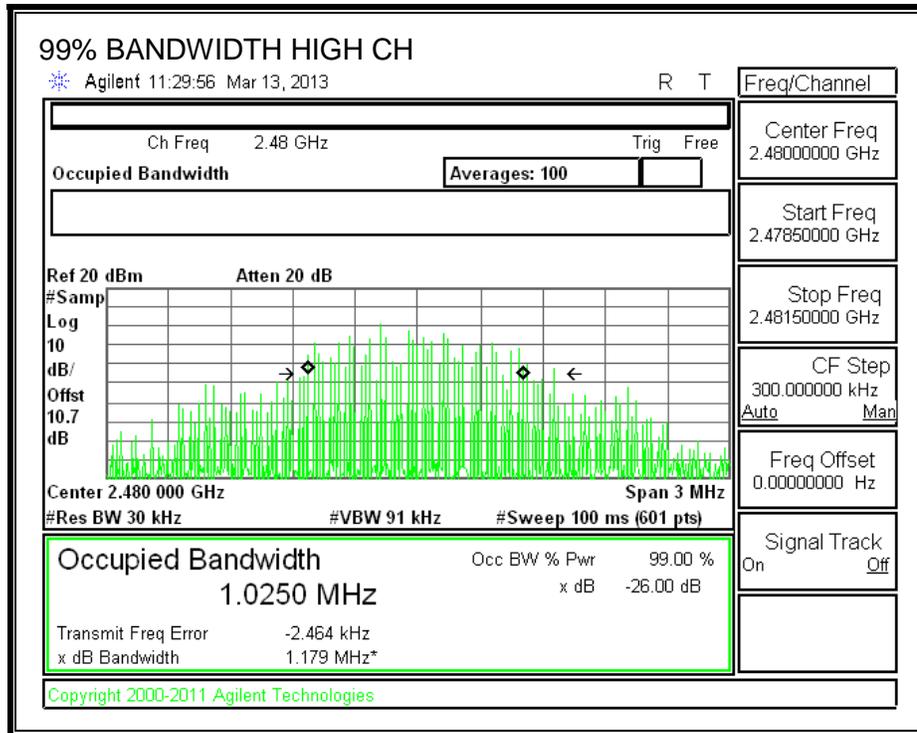
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

#### RESULTS

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Low     | 2402            | 1.0194              |
| Middle  | 2440            | 1.0250              |
| High    | 2480            | 1.0250              |

**99% BANDWIDTH**





### 8.1.3. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter output is connected to a power meter.

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            | 5.11           |
| Middle  | 2440            | 5.97           |
| High    | 2480            | 6.39           |

### 8.1.4. OUTPUT POWER

#### LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

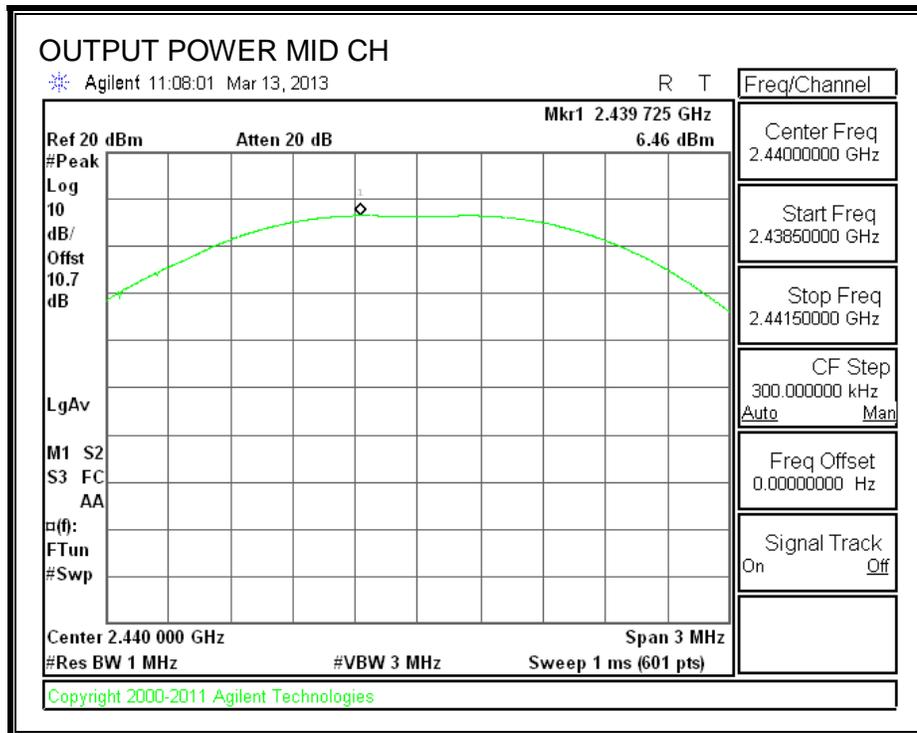
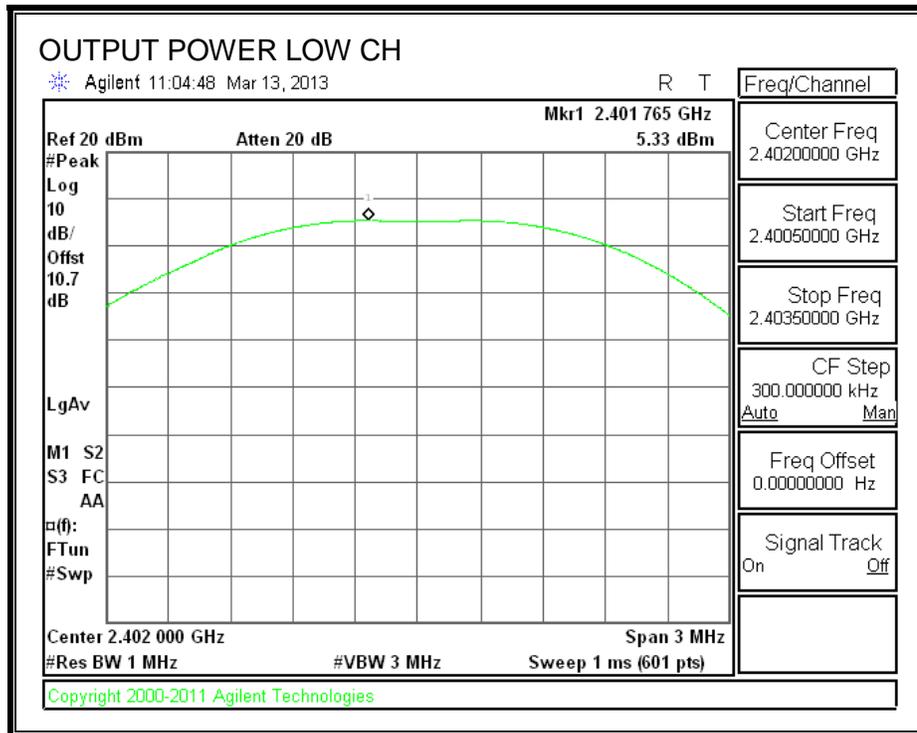
#### DIRECTIONAL ANTENNA GAIN

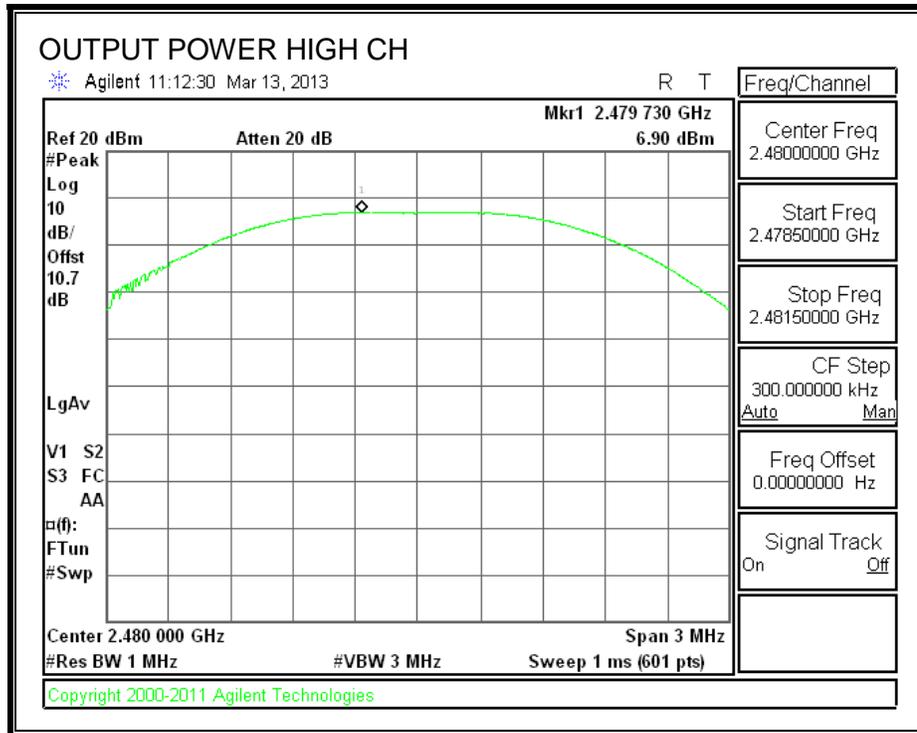
There is only one transmitter output therefore the directional gain is equal to the antenna gain.

#### RESULTS

| Channel | Frequency<br>(MHz) | Peak Power<br>Reading<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|----------------|----------------|
| Low     | 2402               | 5.330                          | 30             | -24.670        |
| Middle  | 2440               | 6.460                          | 30             | -23.540        |
| High    | 2480               | 6.900                          | 30             | -23.100        |

**OUTPUT POWER**





### 8.1.5. POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.247

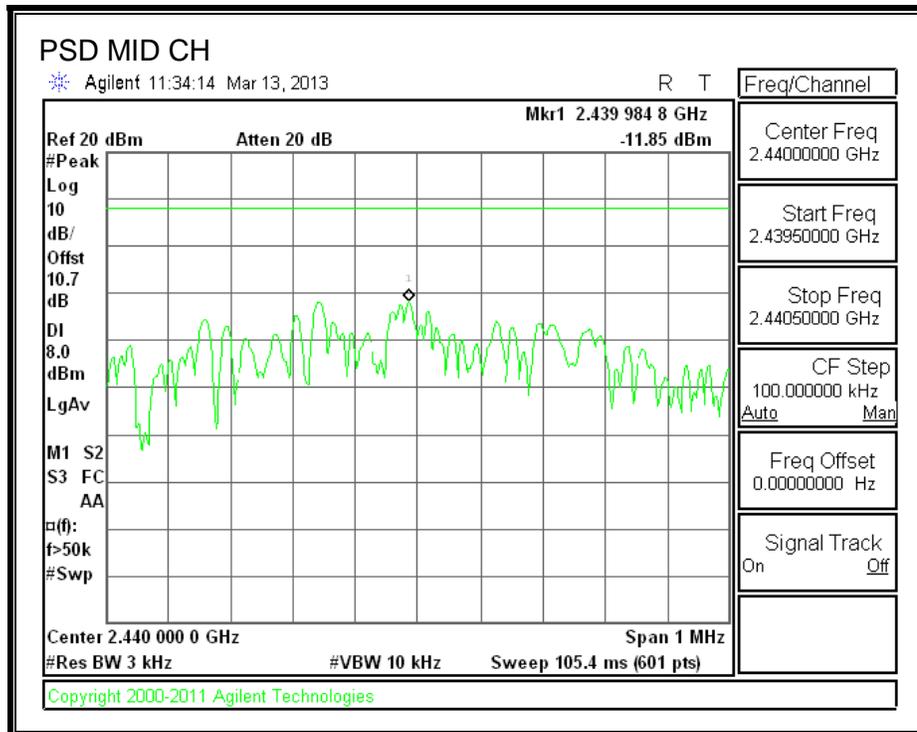
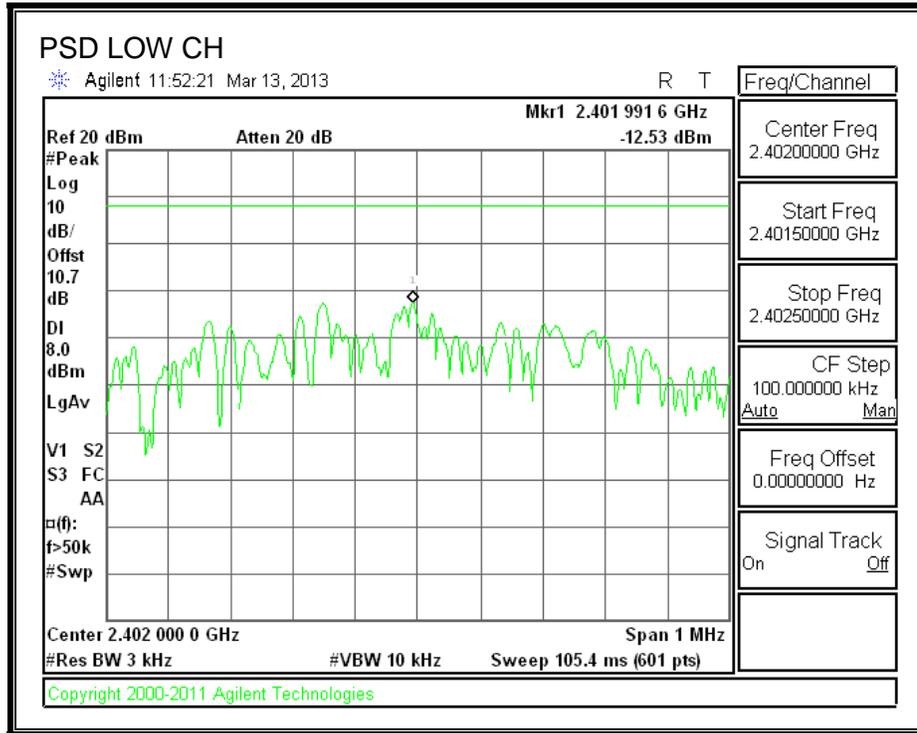
IC RSS-210 A8.2

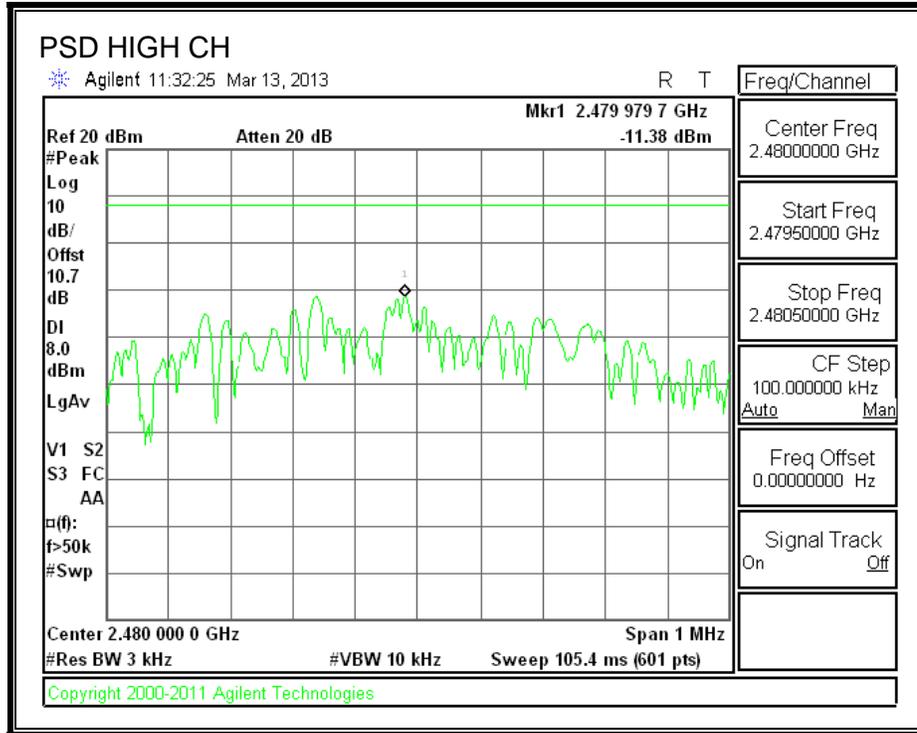
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

#### RESULTS

| Channel | Frequency (MHz) | PSD (dBm) | Limit (dBm) | Margin (dB) |
|---------|-----------------|-----------|-------------|-------------|
| Low     | 2402            | -12.53    | 8           | -20.53      |
| Middle  | 2440            | -11.85    | 8           | -19.85      |
| High    | 2480            | -11.38    | 8           | -19.38      |

**POWER SPECTRAL DENSITY**





## **8.1.6. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

IC RSS-210 A8.5

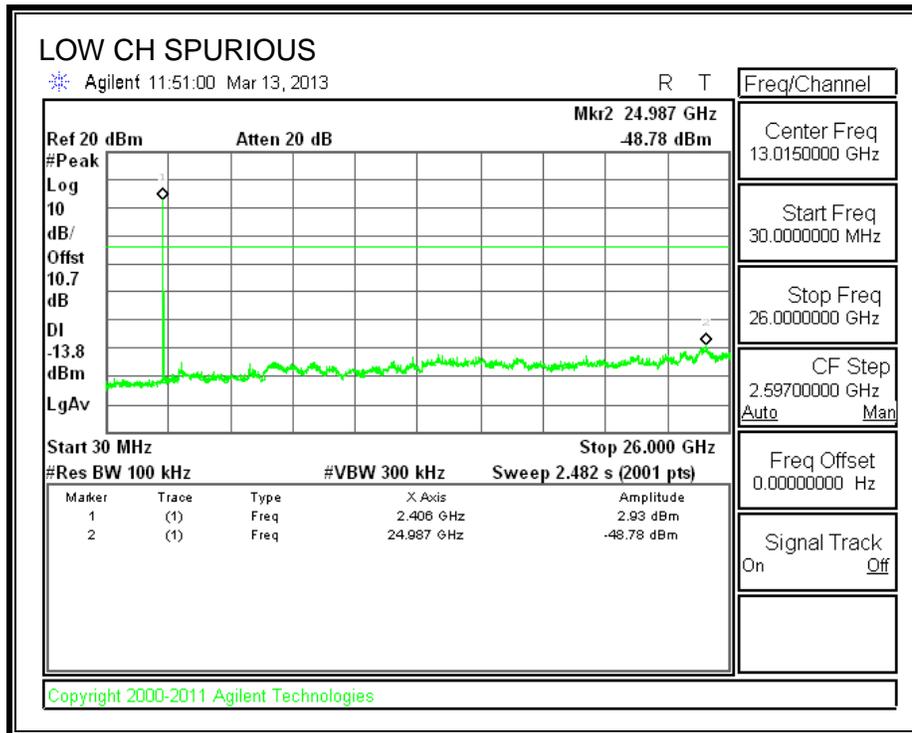
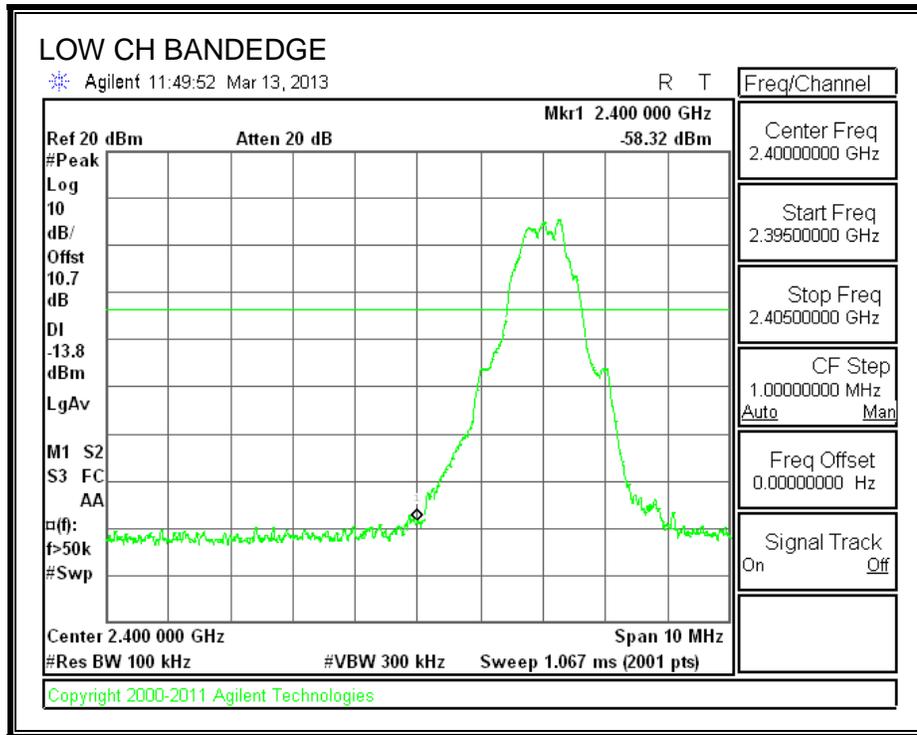
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

### **TEST PROCEDURE**

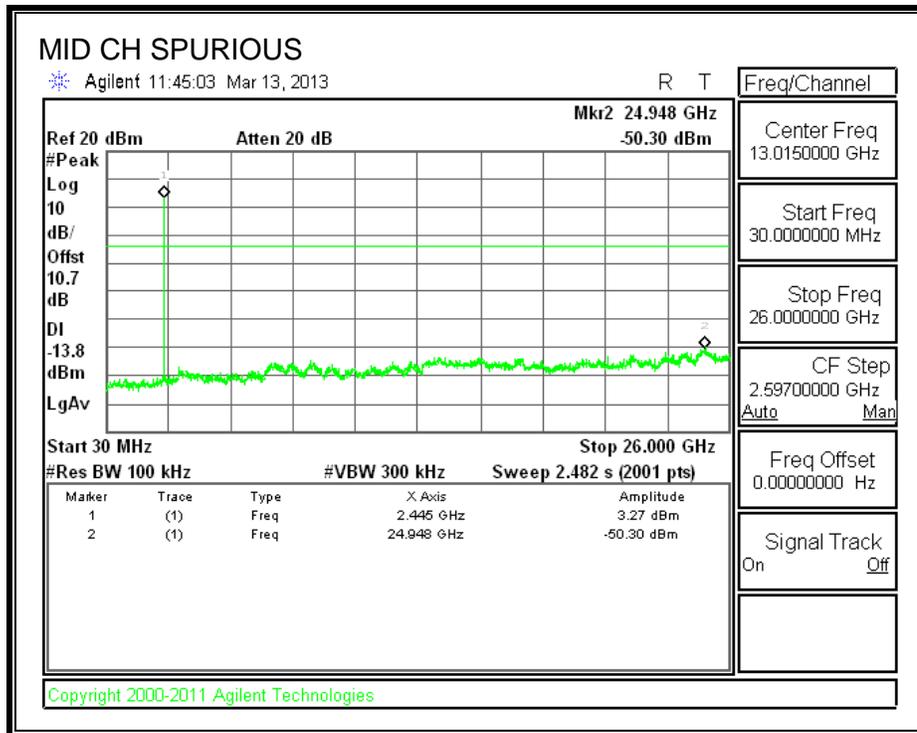
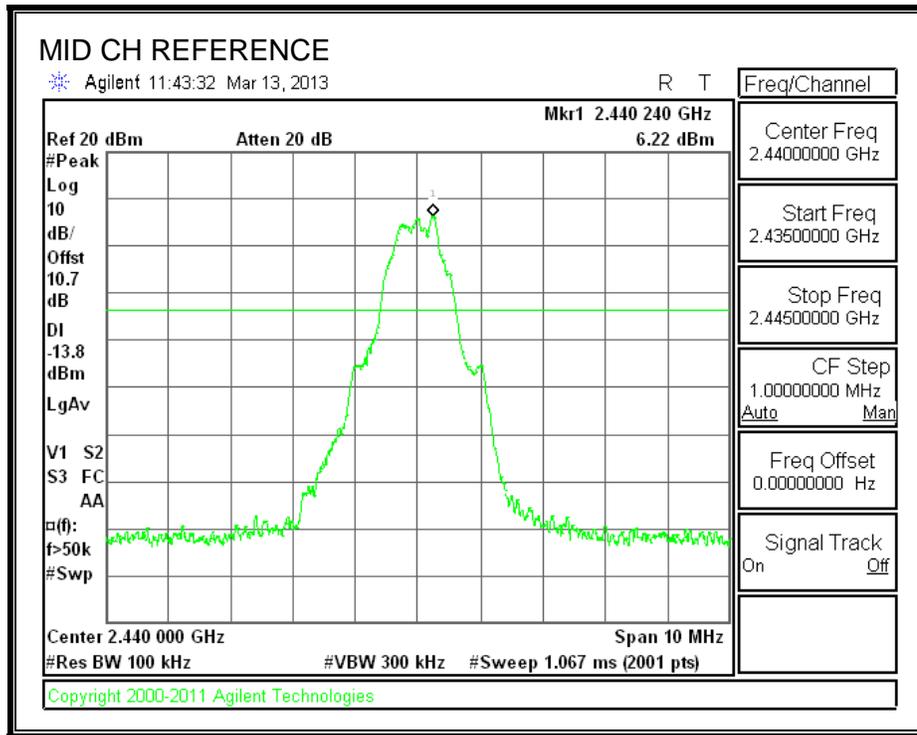
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

**RESULTS**

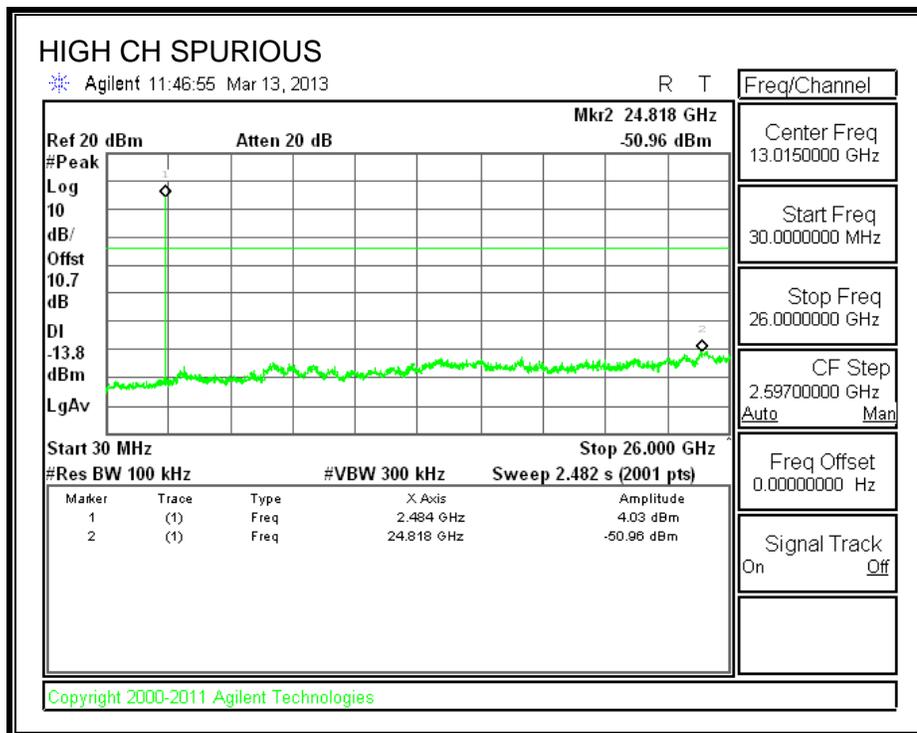
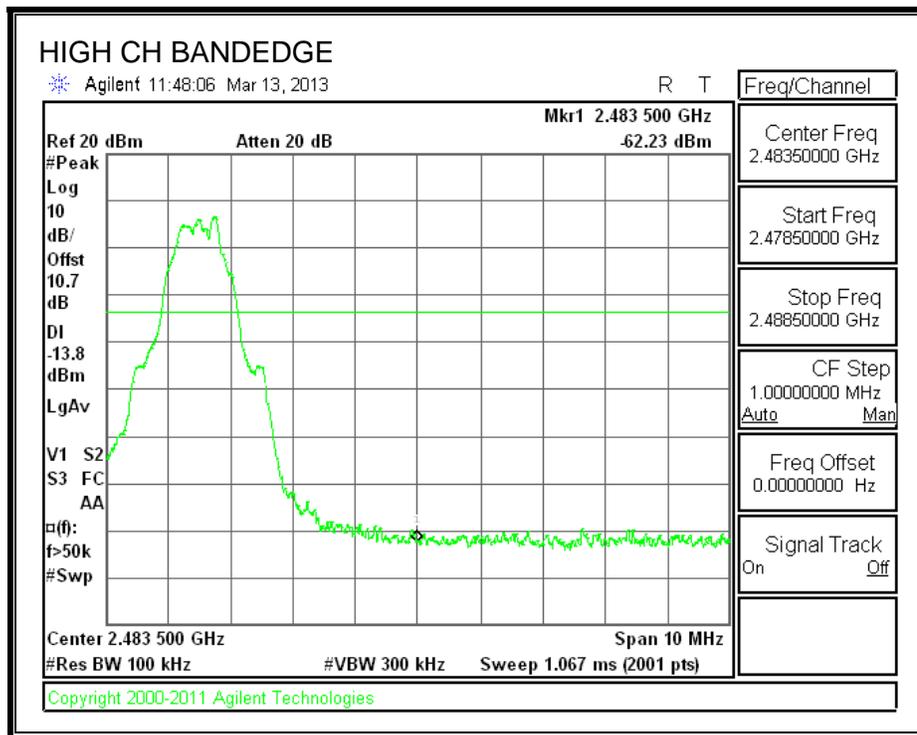
**SPURIOUS EMISSIONS, LOW CHANNEL**



**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.

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.

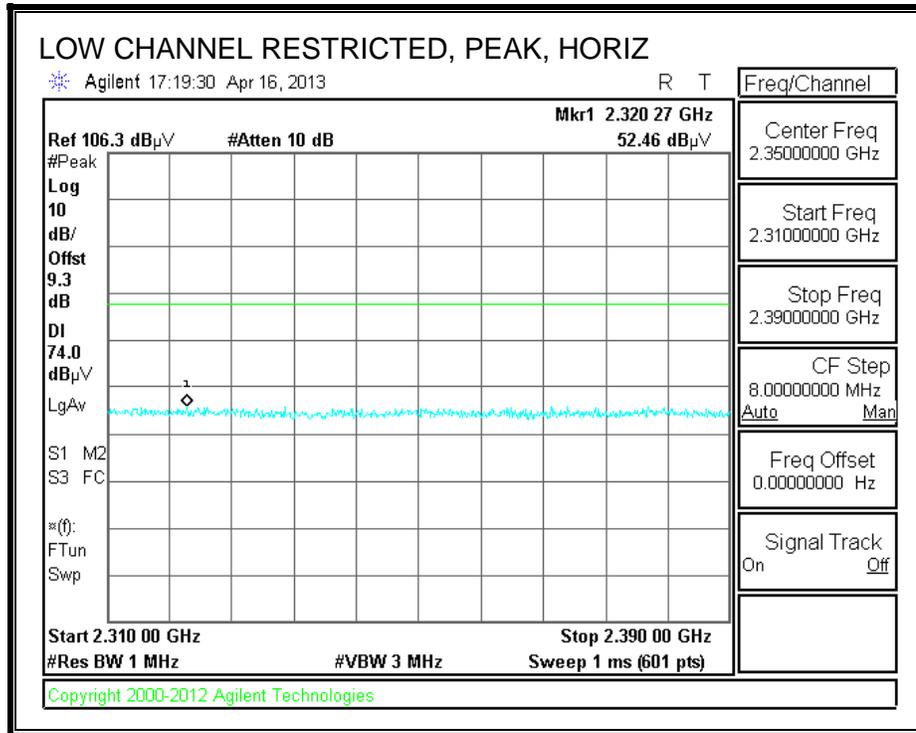
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 1 MHz for peak measurements and as applicable for average measurements.

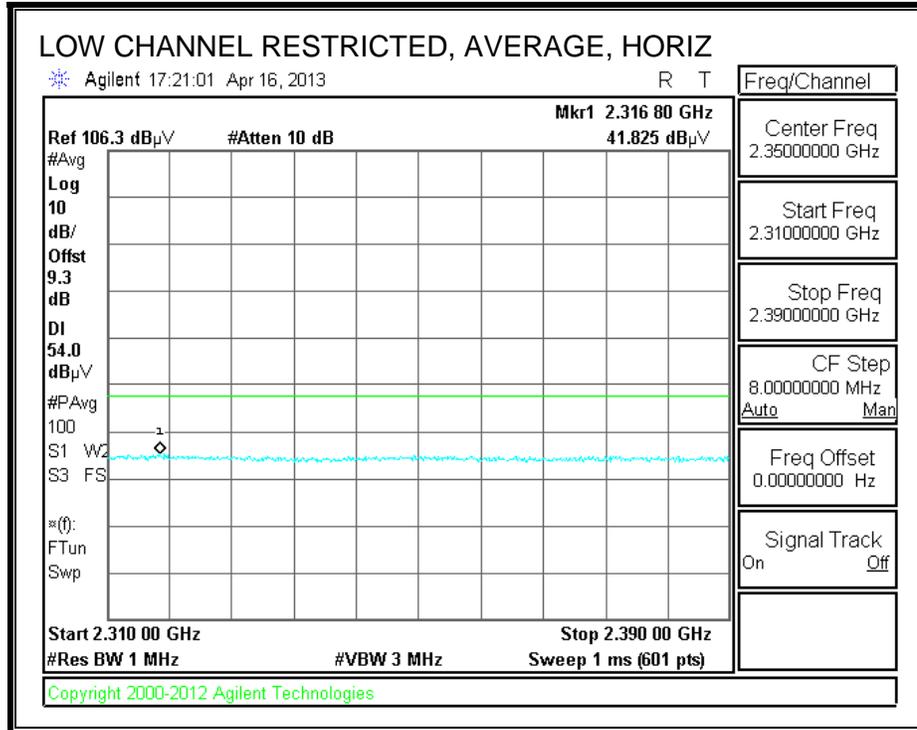
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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.

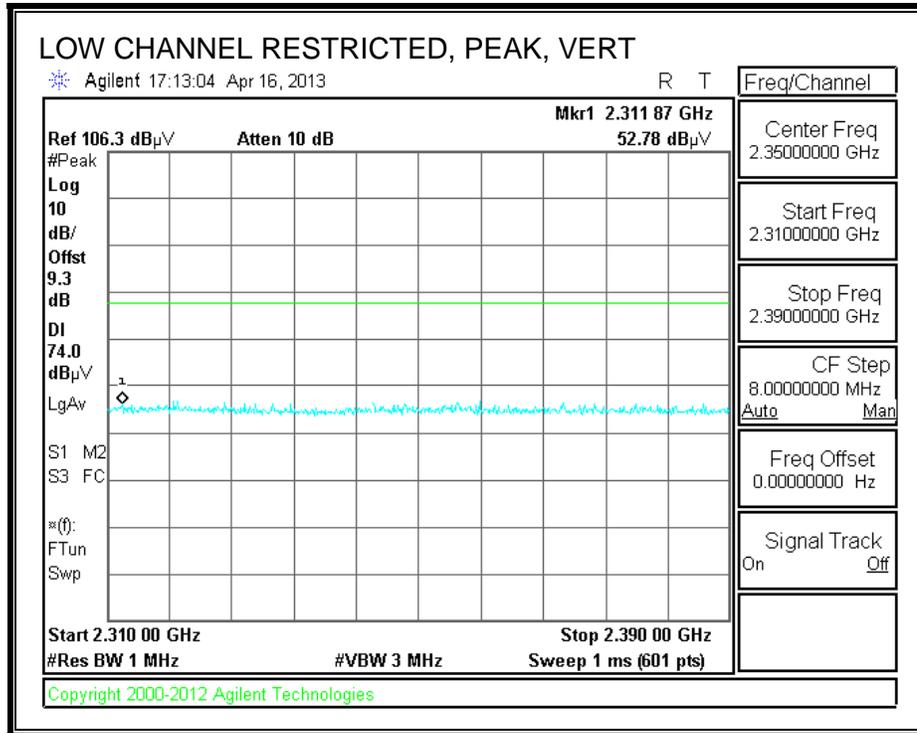
## 9.2. TX ABOVE 1 GHz FOR BLUETOOTH LOW ENERGY MODE IN THE 2.4 GHz BAND

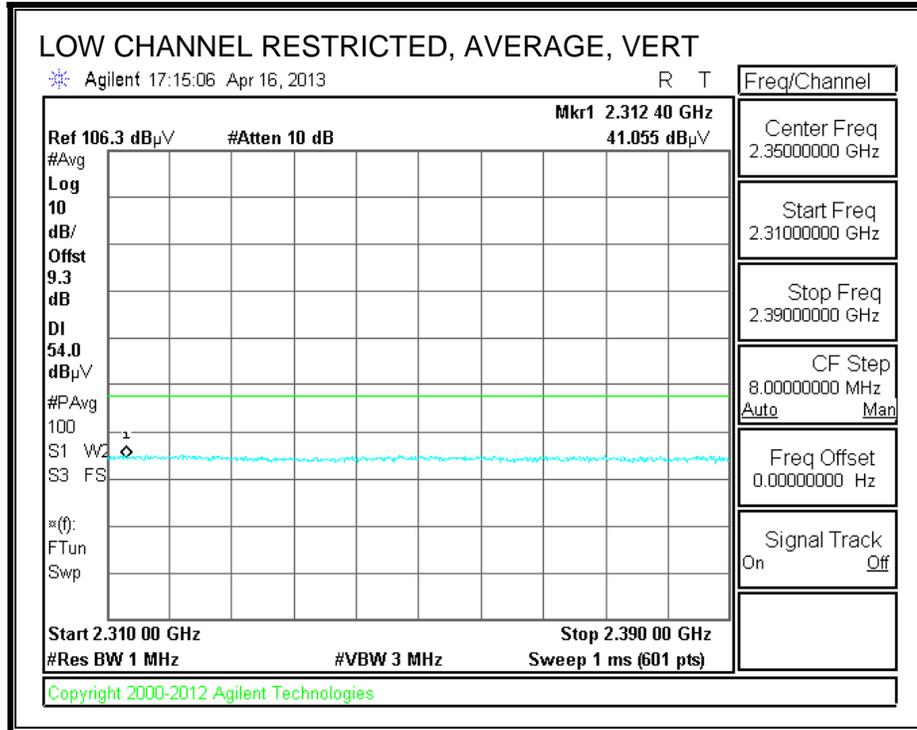
### RESTRICTED BANDEDGE (LOW CHANNEL)





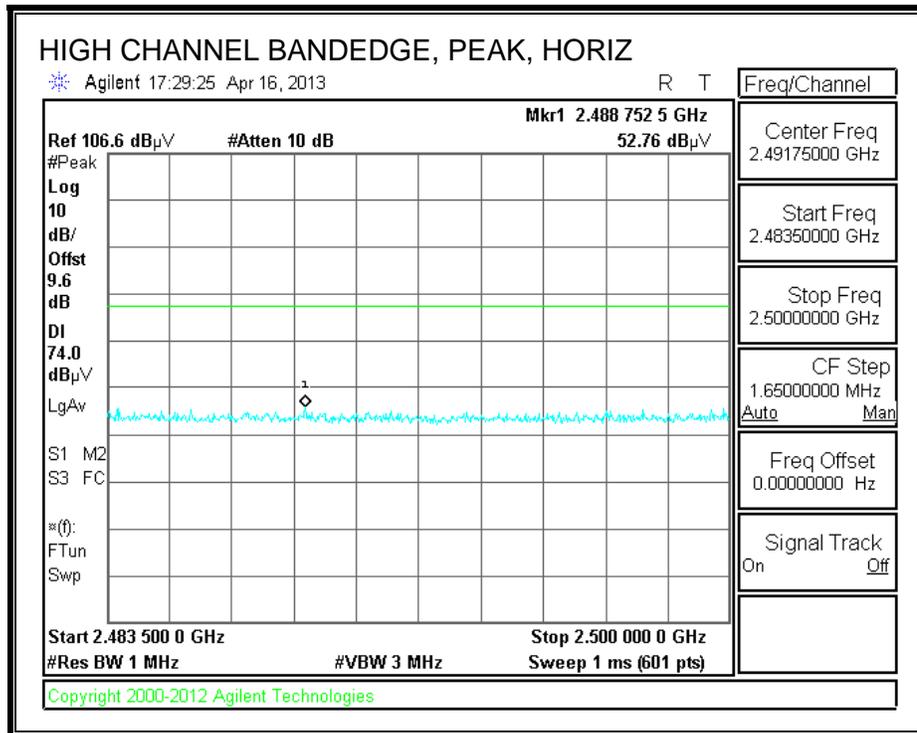
**Actual Average** = Measured Average + Correction Factor  
 = 41.825 dBuV + 7.90  
 = 49.725 dBuV

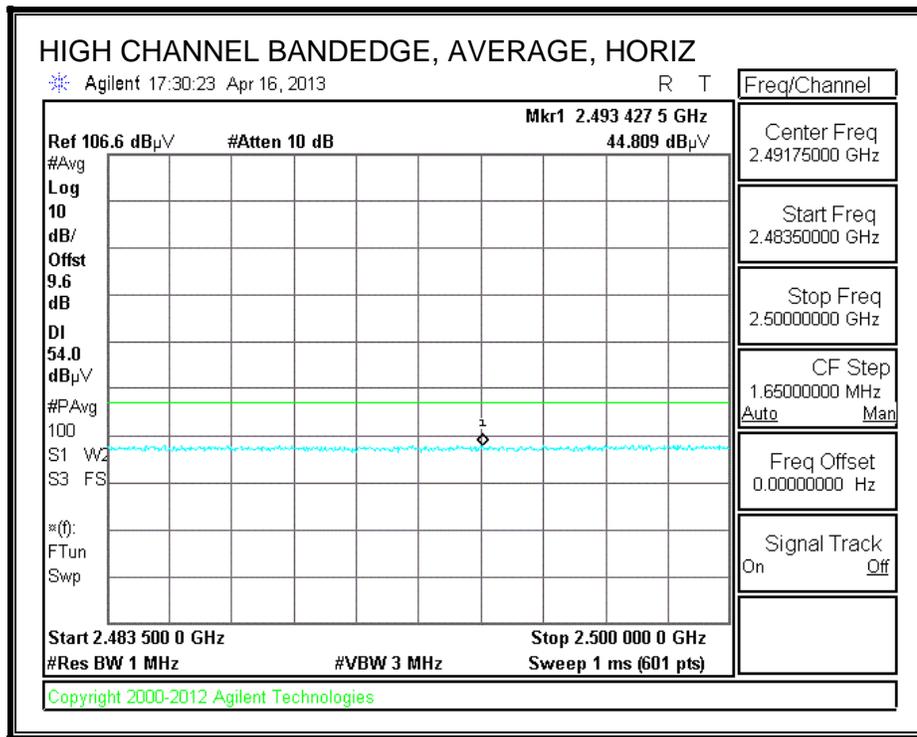




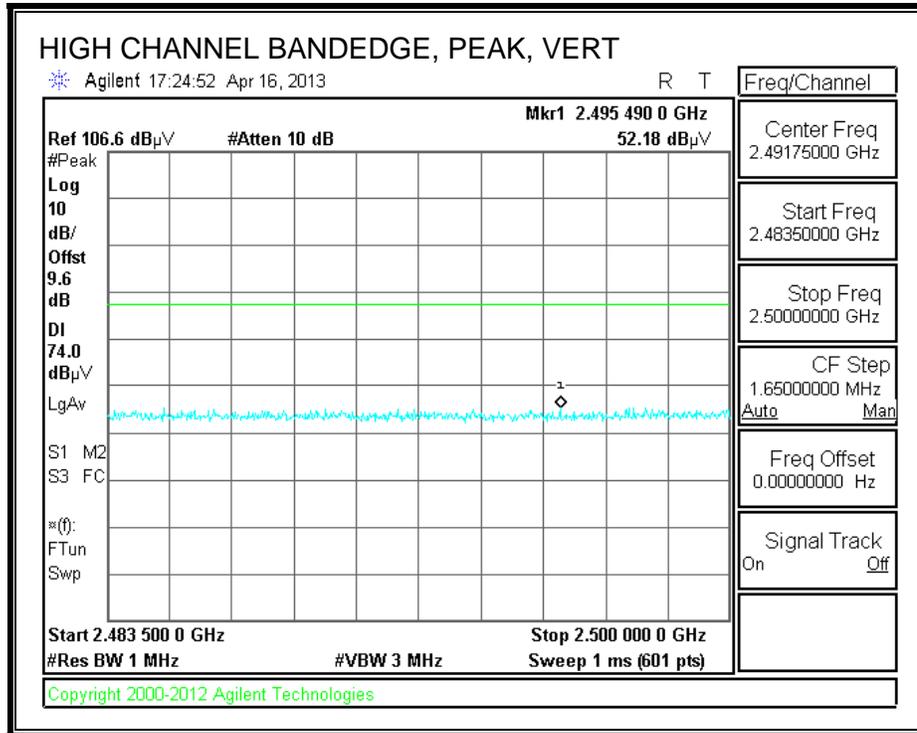
$$\begin{aligned}
 \text{Actual Average} &= \text{Measured Average} + \text{Correction Factor} \\
 &= 41.055 \text{ dB}\mu\text{V} + 7.90 \\
 &= 48.955 \text{ dB}\mu\text{V}
 \end{aligned}$$

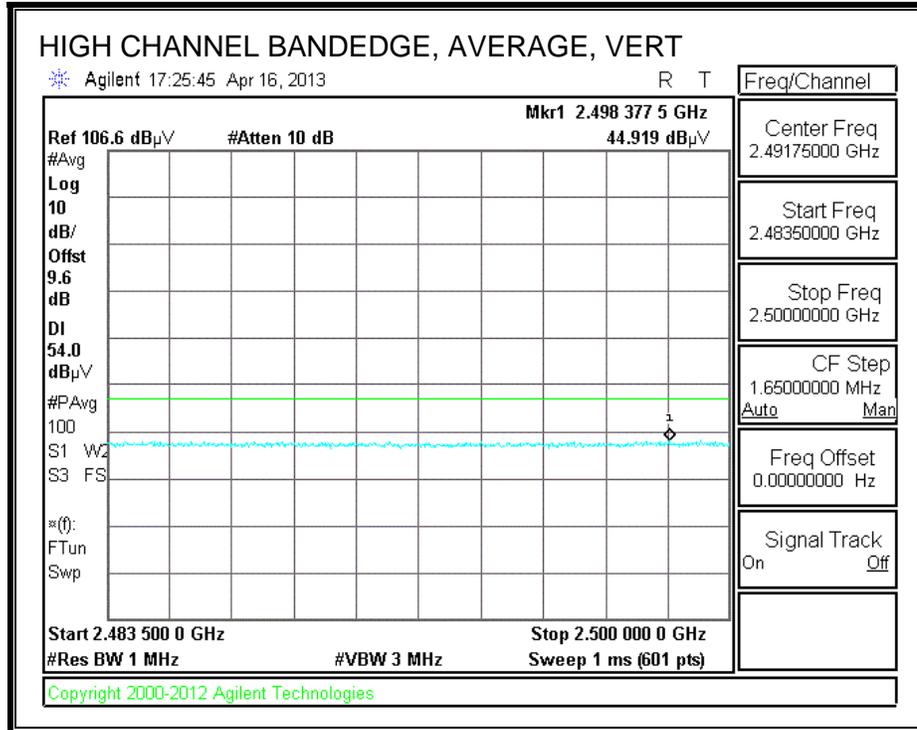
**RESTRICTED BANDEDGE (HIGH CHANNEL)**





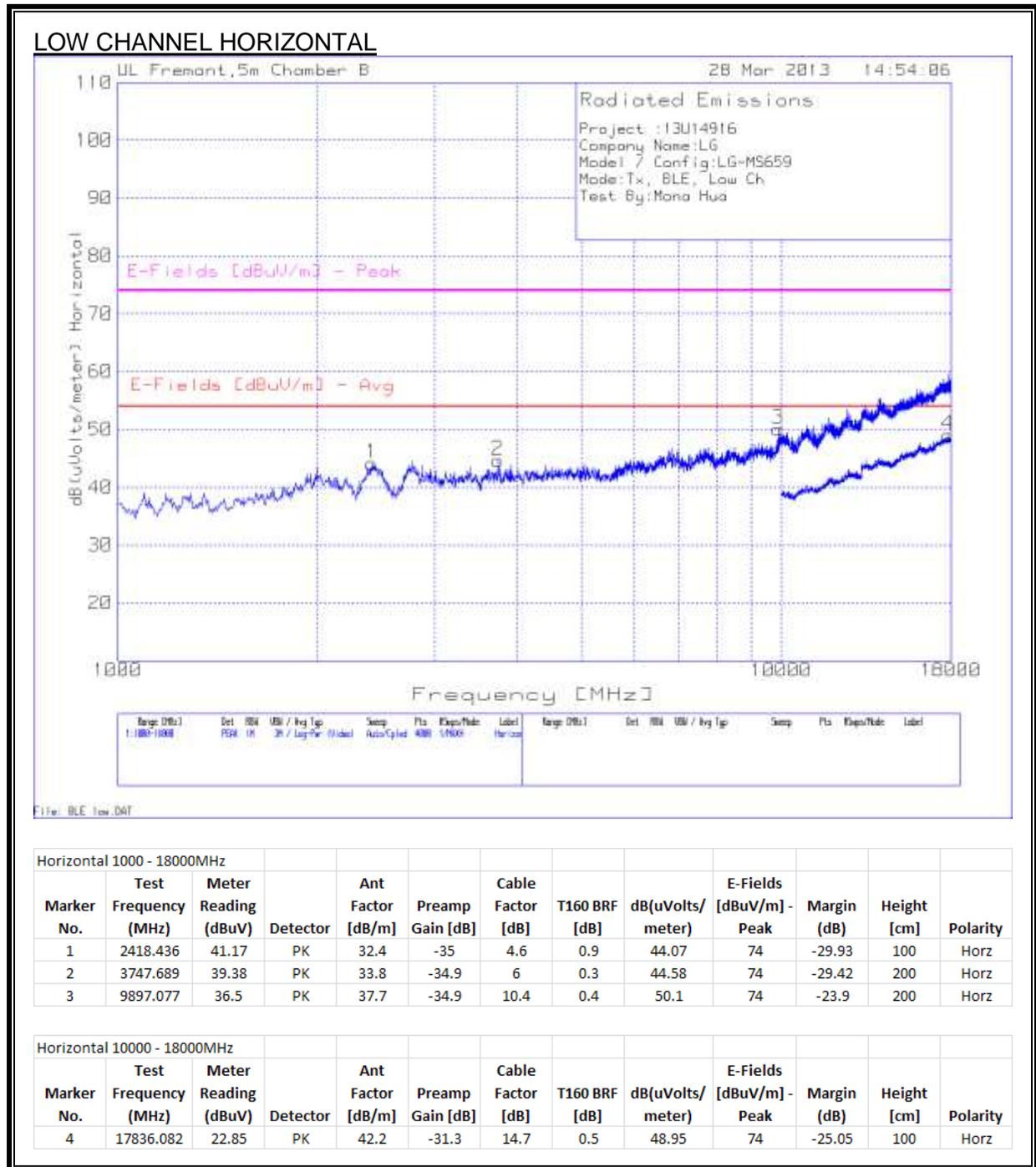
$$\begin{aligned}
 \text{Actual Average} &= \text{Measured Average} + \text{Correction Factor} \\
 &= 44.809 \text{ dB}\mu\text{V} + 7.90 \\
 &= 52.709 \text{ dB}\mu\text{V}
 \end{aligned}$$



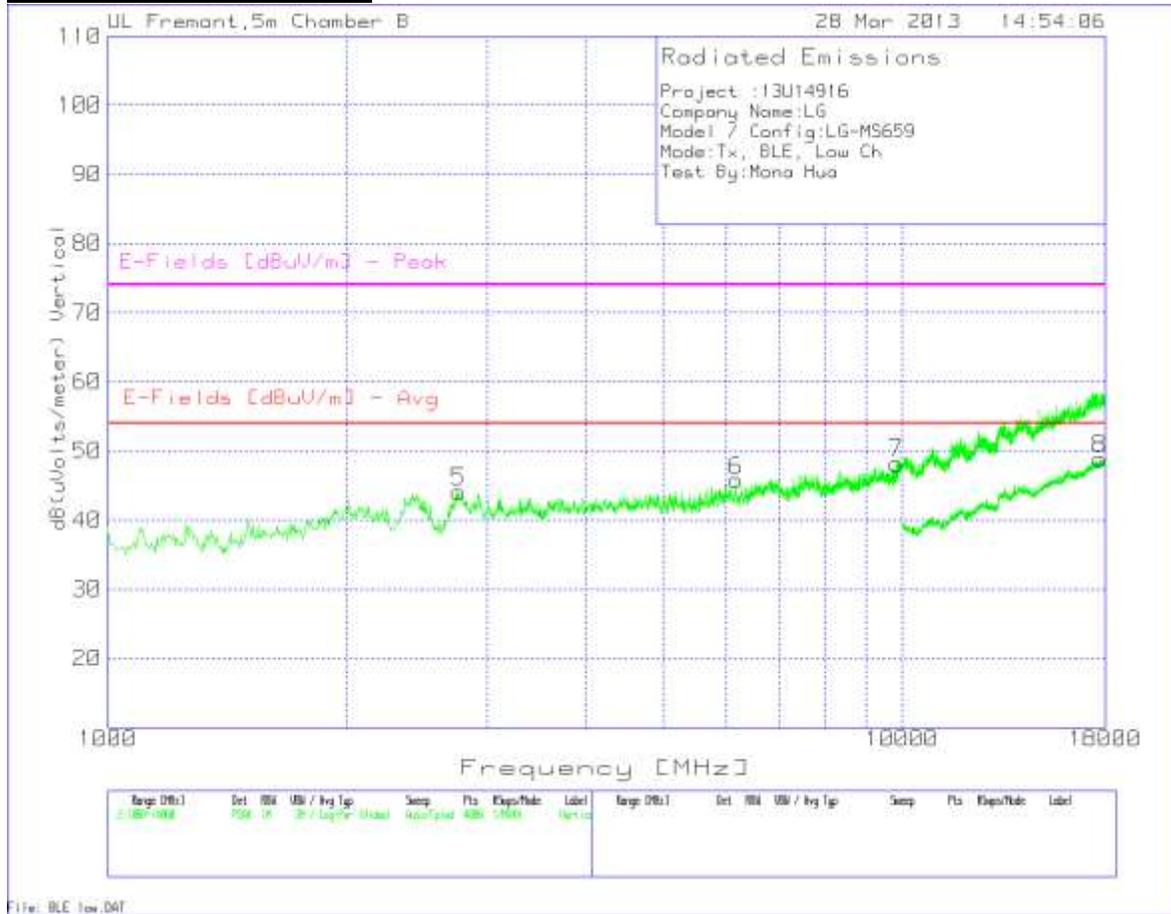


$$\begin{aligned}
 \text{Actual Average} &= \text{Measured Average} + \text{Correction Factor} \\
 &= 44.919 \text{ dB}\mu\text{V} + 7.90 \\
 &= 52.819 \text{ dB}\mu\text{V}
 \end{aligned}$$

**HARMONICS AND SPURIOUS EMISSIONS**



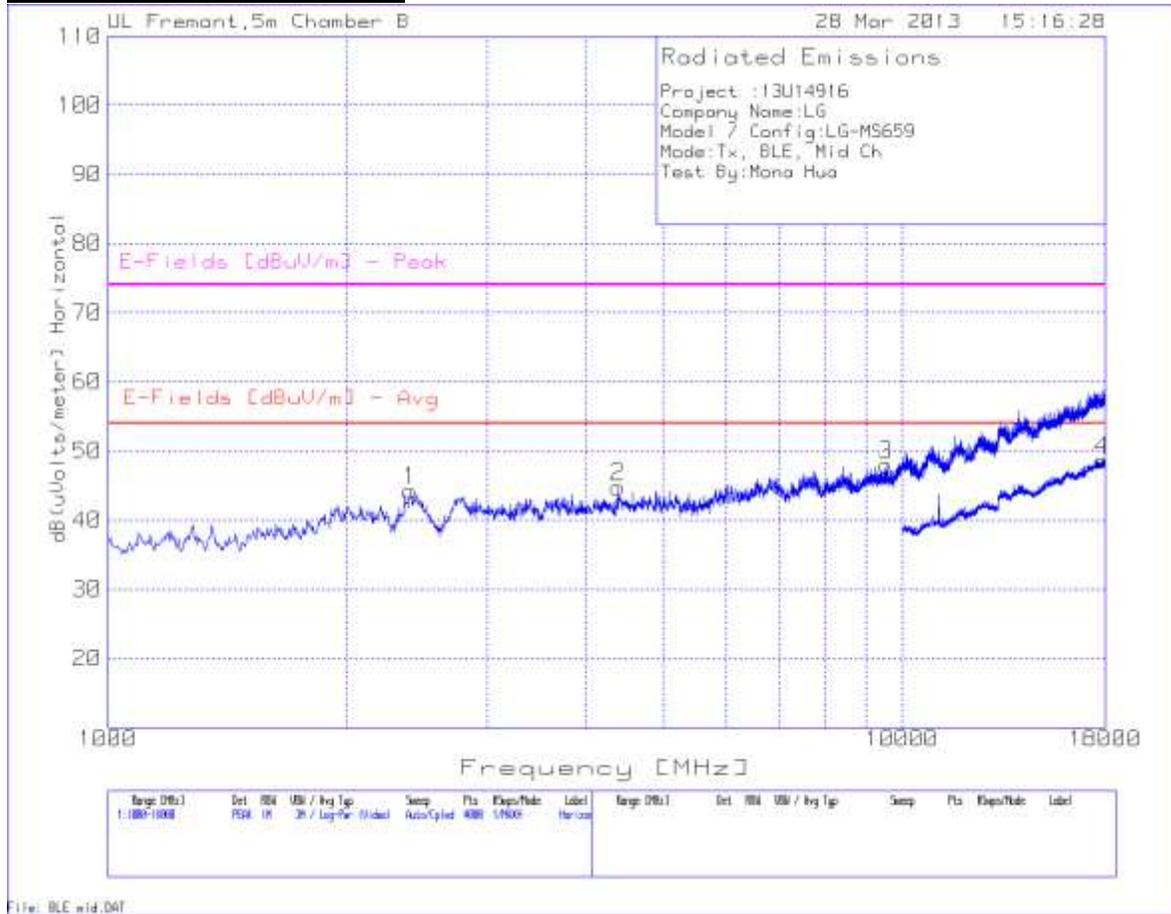
**LOW CHANNEL VERTICAL**



| Vertical 1000 - 18000MHz |                      |                      |          |                   |                  |                   |               |                   |                          |             |             |          |
|--------------------------|----------------------|----------------------|----------|-------------------|------------------|-------------------|---------------|-------------------|--------------------------|-------------|-------------|----------|
| Marker No.               | Test Frequency (MHz) | Meter Reading (dBuV) | Detector | Ant Factor [dB/m] | Preamp Gain [dB] | Cable Factor [dB] | T160 BRF [dB] | dB(uVolts/ meter) | E-Fields [dBuV/m] - Peak | Margin (dB) | Height [cm] | Polarity |
| 5                        | 2762.428             | 40.51                | PK       | 32.8              | -35.1            | 5                 | 0.9           | 44.11             | 74                       | -29.89      | 100         | Vert     |
| 6                        | 6185.361             | 36.35                | PK       | 36                | -34.9            | 8.1               | 0.2           | 45.75             | 74                       | -28.25      | 200         | Vert     |
| 7                        | 9833.375             | 34.7                 | PK       | 37.6              | -34.9            | 10.4              | 0.4           | 48.2              | 74                       | -25.8       | 100         | Vert     |

| Vertical 10000 - 18000MHz |                      |                      |          |                   |                  |                   |               |                   |                          |             |             |          |
|---------------------------|----------------------|----------------------|----------|-------------------|------------------|-------------------|---------------|-------------------|--------------------------|-------------|-------------|----------|
| Marker No.                | Test Frequency (MHz) | Meter Reading (dBuV) | Detector | Ant Factor [dB/m] | Preamp Gain [dB] | Cable Factor [dB] | T160 BRF [dB] | dB(uVolts/ meter) | E-Fields [dBuV/m] - Peak | Margin (dB) | Height [cm] | Polarity |
| 8                         | 17748.126            | 22.84                | PK       | 42.2              | -31.4            | 14.7              | 0.5           | 48.84             | 74                       | -25.16      | 100         | Vert     |

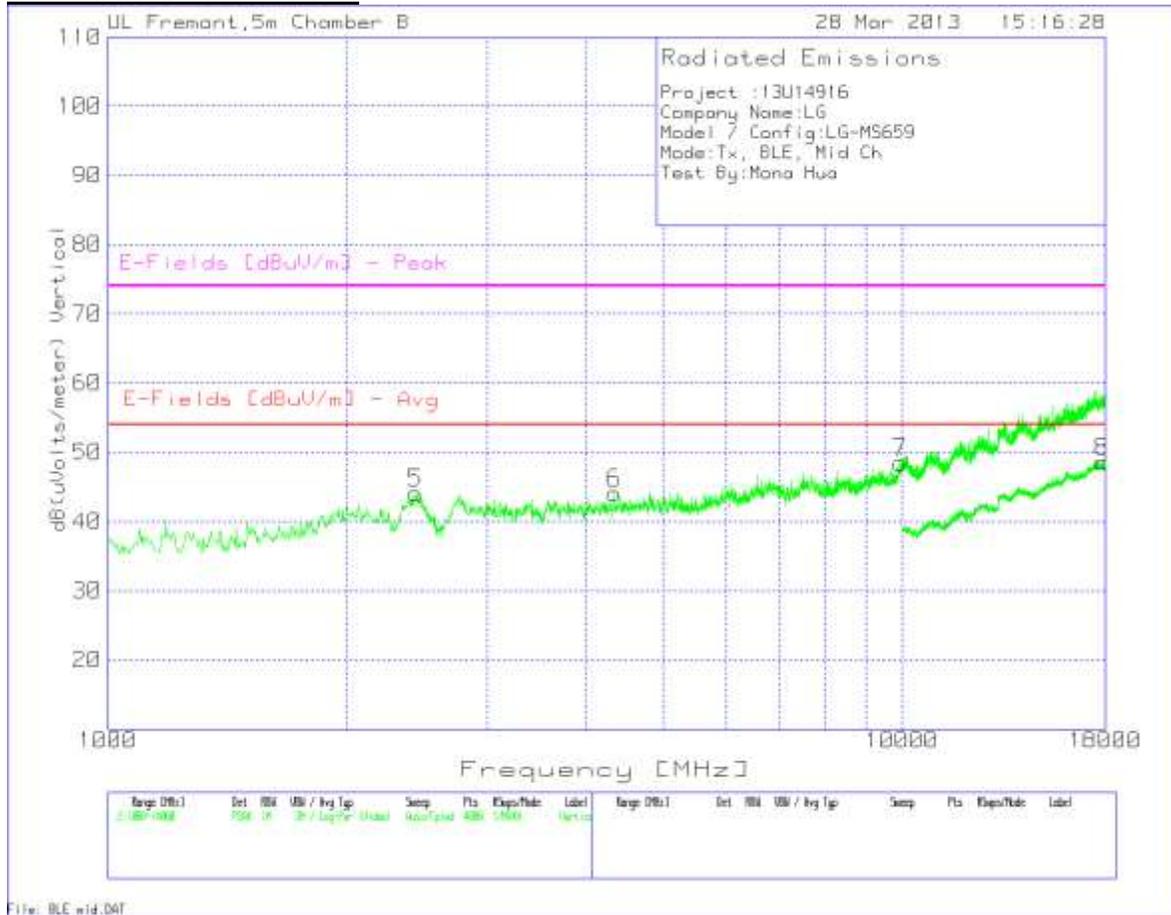
**MID CHANNEL HORIZONTAL**



| Horizontal 1000 - 18000MHz |                      |                      |          |                   |                  |                   |               |                   |                          |             |             |          |
|----------------------------|----------------------|----------------------|----------|-------------------|------------------|-------------------|---------------|-------------------|--------------------------|-------------|-------------|----------|
| Marker No.                 | Test Frequency (MHz) | Meter Reading (dBuV) | Detector | Ant Factor [dB/m] | Preamp Gain [dB] | Cable Factor [dB] | T160 BRF [dB] | dB(uVolts/ meter) | E-Fields [dBuV/m] - Peak | Margin (dB) | Height [cm] | Polarity |
| 1                          | 2405.696             | 41.39                | PK       | 32.3              | -35              | 4.6               | 0.9           | 44.19             | 74                       | -29.81      | 100         | Horz     |
| 2                          | 4384.711             | 38.53                | PK       | 34.3              | -34.9            | 6.6               | 0.2           | 44.73             | 74                       | -29.27      | 200         | Horz     |
| 3                          | 9540.345             | 34.96                | PK       | 37.2              | -35              | 10.2              | 0.6           | 47.96             | 74                       | -26.04      | 200         | Horz     |

| Horizontal 10000 - 18000MHz |                      |                      |          |                   |                  |                   |               |                   |                          |             |             |          |
|-----------------------------|----------------------|----------------------|----------|-------------------|------------------|-------------------|---------------|-------------------|--------------------------|-------------|-------------|----------|
| Marker No.                  | Test Frequency (MHz) | Meter Reading (dBuV) | Detector | Ant Factor [dB/m] | Preamp Gain [dB] | Cable Factor [dB] | T160 BRF [dB] | dB(uVolts/ meter) | E-Fields [dBuV/m] - Peak | Margin (dB) | Height [cm] | Polarity |
| 4                           | 17892.054            | 22.35                | PK       | 42.2              | -31.3            | 14.8              | 0.6           | 48.65             | 74                       | -25.35      | 200         | Horz     |

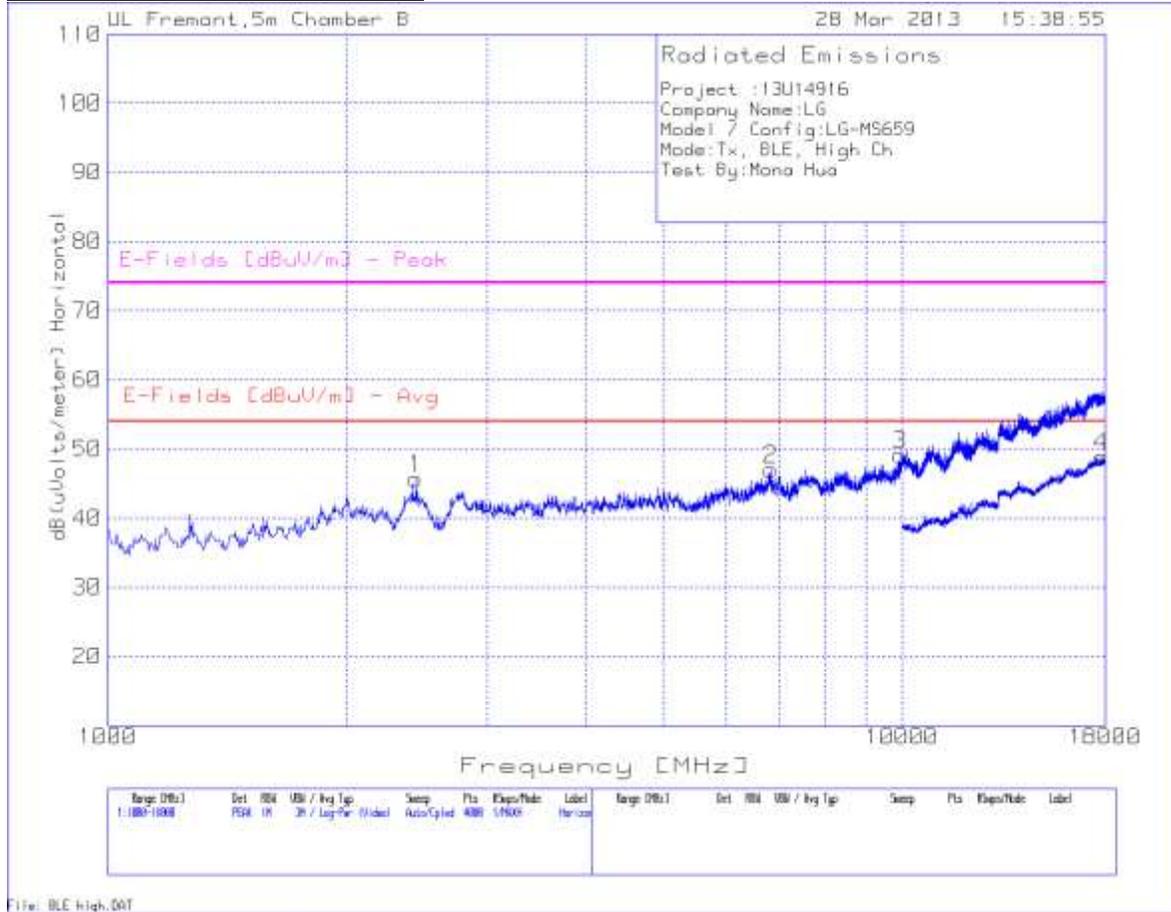
MID CHANNEL VERTICAL



| Vertical 1000 - 18000MHz |                      |                      |          |                   |                  |                   |               |                   |                          |             |             |          |
|--------------------------|----------------------|----------------------|----------|-------------------|------------------|-------------------|---------------|-------------------|--------------------------|-------------|-------------|----------|
| Marker No.               | Test Frequency (MHz) | Meter Reading (dBuV) | Detector | Ant Factor [dB/m] | Preamp Gain [dB] | Cable Factor [dB] | T160 BRF [dB] | dB(uVolts/ meter) | E-Fields [dBuV/m] - Peak | Margin (dB) | Height [cm] | Polarity |
| 5                        | 2439.67              | 41.14                | PK       | 32.4              | -35              | 4.7               | 0.9           | 44.14             | 74                       | -29.86      | 100         | Vert     |
| 6                        | 4342.243             | 37.95                | PK       | 34.2              | -34.9            | 6.6               | 0.3           | 44.15             | 74                       | -29.85      | 200         | Vert     |
| 7                        | 9931.052             | 34.91                | PK       | 37.7              | -34.9            | 10.4              | 0.4           | 48.51             | 74                       | -25.49      | 200         | Vert     |

| Vertical 10000 - 18000MHz |                      |                      |          |                   |                  |                   |               |                   |                          |             |             |          |
|---------------------------|----------------------|----------------------|----------|-------------------|------------------|-------------------|---------------|-------------------|--------------------------|-------------|-------------|----------|
| Marker No.                | Test Frequency (MHz) | Meter Reading (dBuV) | Detector | Ant Factor [dB/m] | Preamp Gain [dB] | Cable Factor [dB] | T160 BRF [dB] | dB(uVolts/ meter) | E-Fields [dBuV/m] - Peak | Margin (dB) | Height [cm] | Polarity |
| 8                         | 17848.076            | 22.54                | PK       | 42.2              | -31.3            | 14.7              | 0.5           | 48.64             | 74                       | -25.36      | 200         | Vert     |

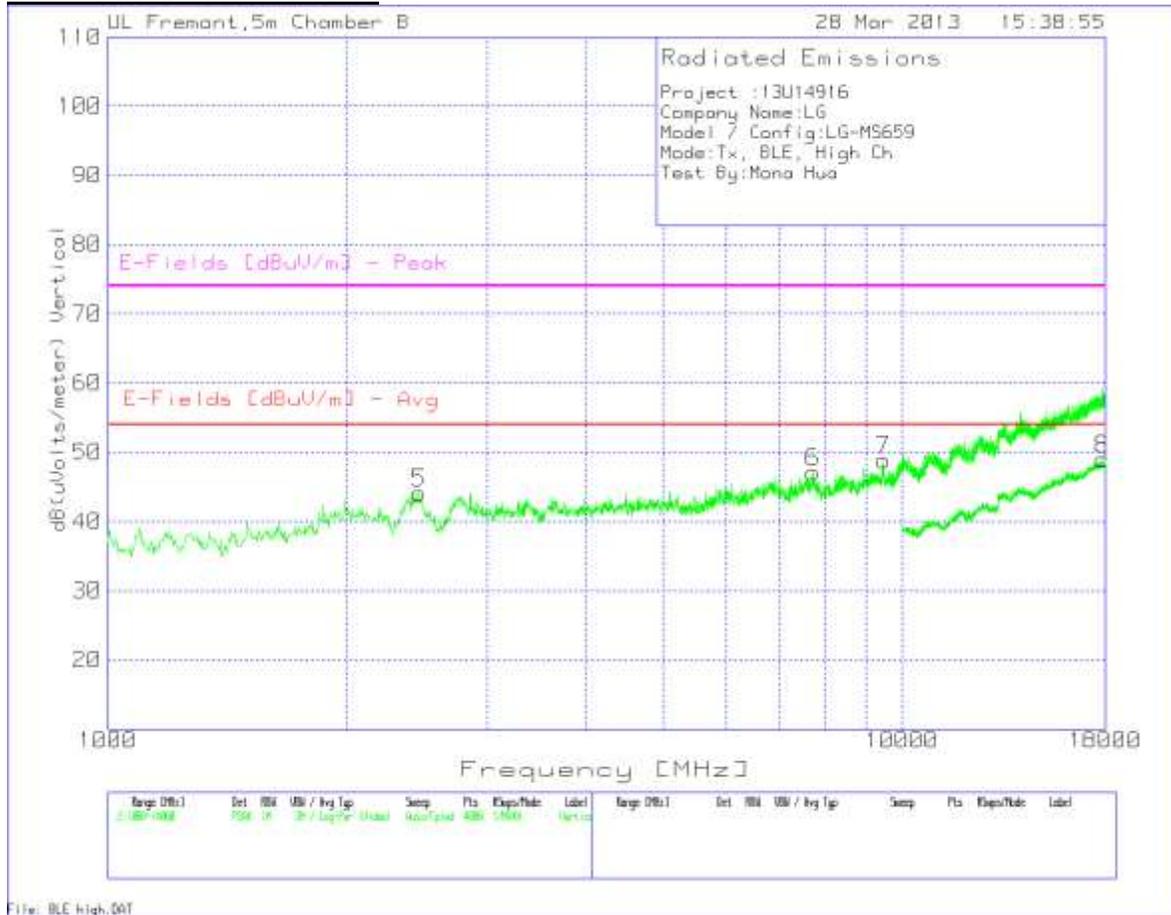
**HIGH CHANNEL HORIZONTAL**



| Horizontal 1000 - 18000MHz |                      |                      |          |                   |                  |                   |               |                   |                          |             |             |          |
|----------------------------|----------------------|----------------------|----------|-------------------|------------------|-------------------|---------------|-------------------|--------------------------|-------------|-------------|----------|
| Marker No.                 | Test Frequency (MHz) | Meter Reading (dBuV) | Detector | Ant Factor [dB/m] | Preamp Gain [dB] | Cable Factor [dB] | T160 BRF [dB] | dB(uVolts/ meter) | E-Fields [dBuV/m] - Peak | Margin (dB) | Height [cm] | Polarity |
| 1                          | 2443.917             | 42.7                 | PK       | 32.4              | -35              | 4.7               | 0.9           | 45.7              | 74                       | -28.3       | 100         | Horz     |
| 2                          | 6830.877             | 37.36                | PK       | 35.8              | -35              | 8.6               | 0.3           | 47.06             | 74                       | -26.94      | 200         | Horz     |
| 3                          | 9943.792             | 35.47                | PK       | 37.7              | -34.9            | 10.4              | 0.5           | 49.17             | 74                       | -24.83      | 200         | Horz     |

| Horizontal 10000 - 18000MHz |                      |                      |          |                   |                  |                   |               |                   |                          |             |             |          |
|-----------------------------|----------------------|----------------------|----------|-------------------|------------------|-------------------|---------------|-------------------|--------------------------|-------------|-------------|----------|
| Marker No.                  | Test Frequency (MHz) | Meter Reading (dBuV) | Detector | Ant Factor [dB/m] | Preamp Gain [dB] | Cable Factor [dB] | T160 BRF [dB] | dB(uVolts/ meter) | E-Fields [dBuV/m] - Peak | Margin (dB) | Height [cm] | Polarity |
| 4                           | 17816.092            | 22.71                | PK       | 42.2              | -31.4            | 14.7              | 0.7           | 48.91             | 74                       | -25.09      | 100         | Horz     |

**HIGH CHANNEL VERTICAL**

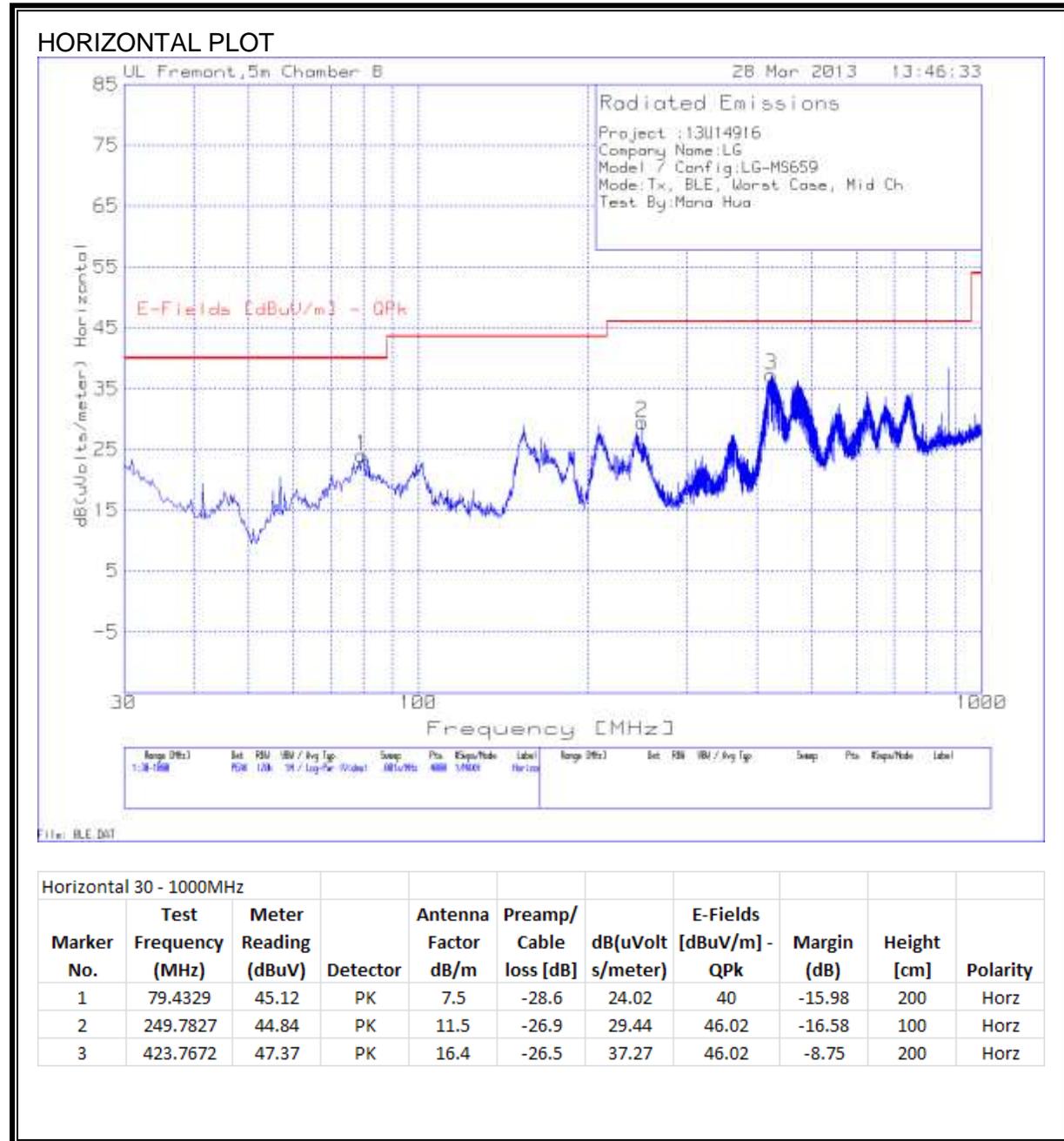


| Vertical 1000 - 18000MHz |                      |                      |          |                   |                  |                   |               |                   |                          |             |             |          |
|--------------------------|----------------------|----------------------|----------|-------------------|------------------|-------------------|---------------|-------------------|--------------------------|-------------|-------------|----------|
| Marker No.               | Test Frequency (MHz) | Meter Reading (dBuV) | Detector | Ant Factor [dB/m] | Preamp Gain [dB] | Cable Factor [dB] | T160 BRF [dB] | dB(uVolts/ meter) | E-Fields [dBuV/m] - Peak | Margin (dB) | Height [cm] | Polarity |
| 5                        | 2469.398             | 41.02                | PK       | 32.5              | -35              | 4.7               | 0.9           | 44.12             | 74                       | -29.88      | 200         | Vert     |
| 6                        | 7718.461             | 36.79                | PK       | 36.2              | -35.1            | 9.1               | 0.2           | 47.19             | 74                       | -26.81      | 200         | Vert     |
| 7                        | 9472.396             | 36.05                | PK       | 37.2              | -35.1            | 10.2              | 0.5           | 48.85             | 74                       | -25.15      | 100         | Vert     |

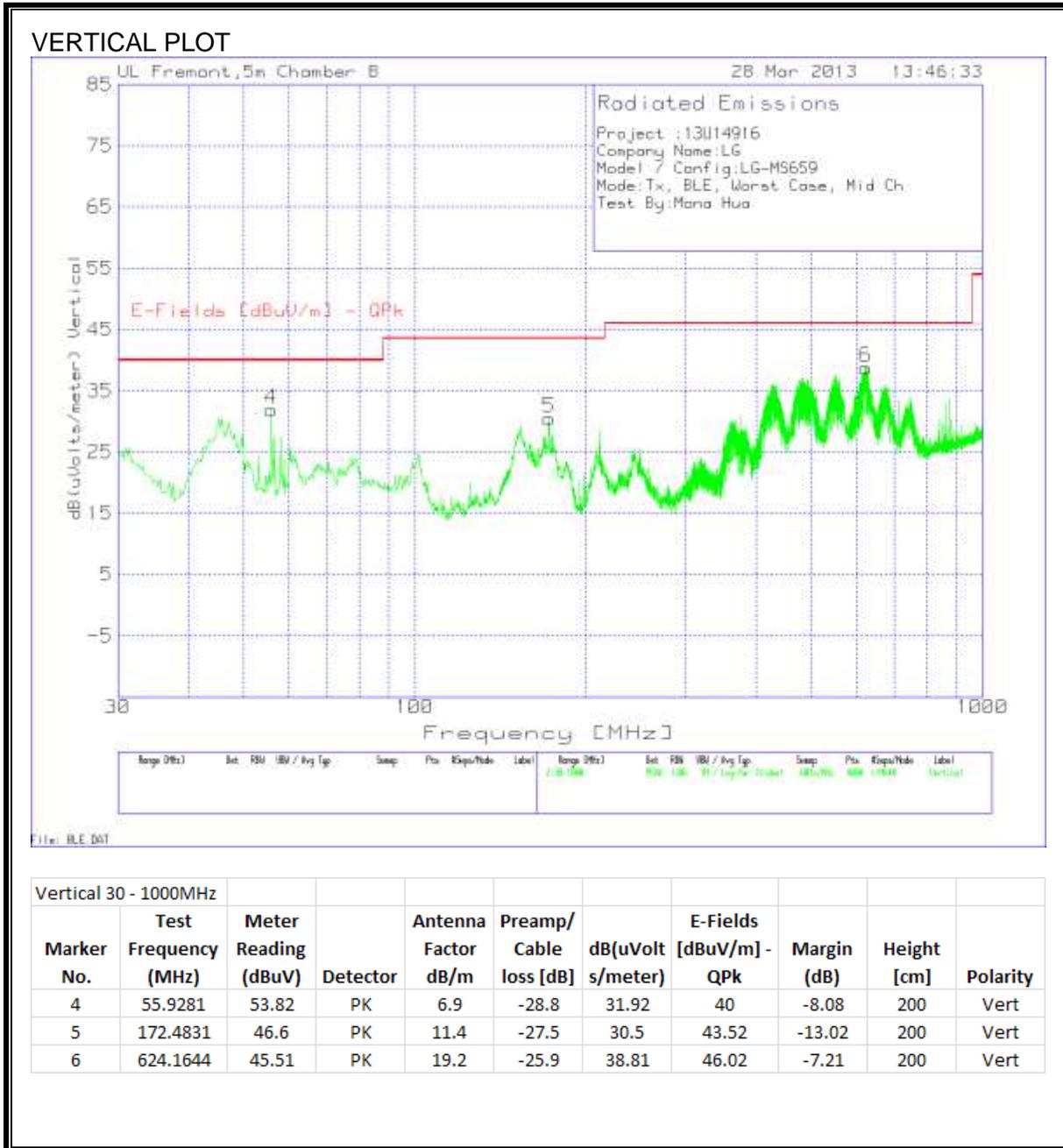
| Vertical 10000 - 18000MHz |                      |                      |          |                   |                  |                   |               |                   |                          |             |             |          |
|---------------------------|----------------------|----------------------|----------|-------------------|------------------|-------------------|---------------|-------------------|--------------------------|-------------|-------------|----------|
| Marker No.                | Test Frequency (MHz) | Meter Reading (dBuV) | Detector | Ant Factor [dB/m] | Preamp Gain [dB] | Cable Factor [dB] | T160 BRF [dB] | dB(uVolts/ meter) | E-Fields [dBuV/m] - Peak | Margin (dB) | Height [cm] | Polarity |
| 8                         | 17868.066            | 22.64                | PK       | 42.2              | -31.3            | 14.8              | 0.6           | 48.94             | 74                       | -25.06      | 100         | Vert     |

### 9.3. WORST-CASE BELOW 1 GHz

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



**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)**



## 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

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 C63.4.

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

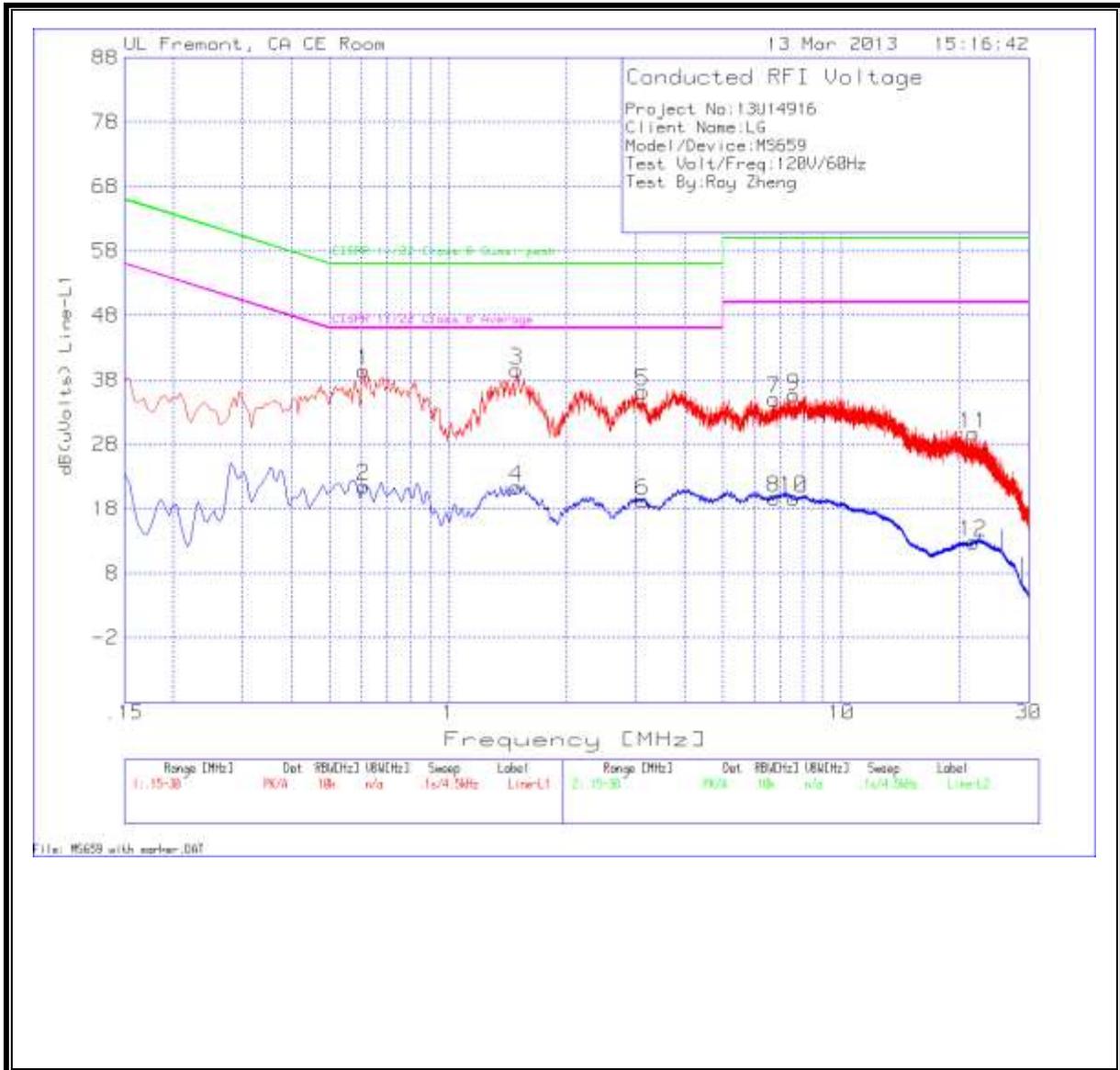
Line conducted data is recorded for both NEUTRAL and HOT lines.

**RESULTS**

**6 WORST EMISSIONS**

| <b>Project No:</b>       |               | 13U14916  |                    |                        |            |                                |        |                             |        |
|--------------------------|---------------|-----------|--------------------|------------------------|------------|--------------------------------|--------|-----------------------------|--------|
| <b>Client Name:</b>      |               | LG        |                    |                        |            |                                |        |                             |        |
| <b>Model/Device:</b>     |               | MS659     |                    |                        |            |                                |        |                             |        |
| <b>Test Volt/Freq:</b>   |               | 120V/60Hz |                    |                        |            |                                |        |                             |        |
| <b>Test By:</b>          |               | Roy Zheng |                    |                        |            |                                |        |                             |        |
|                          |               |           |                    |                        |            |                                |        |                             |        |
| Test Frequency           | Meter Reading | Detector  | T24 IL L1.TXT (dB) | LC Cables 1&3.TXT (dB) | dB(uVolts) | CISPR 11/22 Class B Quasi-peak | Margin | CISPR 11/22 Class B Average | Margin |
| Line-L1 .15 - 30MHz      |               |           |                    |                        |            |                                |        |                             |        |
| 0.609                    | 39.26         | PK        | 0.1                | 0                      | 39.36      | 56                             | -16.64 | -                           | -      |
| 0.609                    | 21.32         | Av        | 0.1                | 0                      | 21.42      | -                              | -      | 46                          | -24.58 |
| 1.4955                   | 39.3          | PK        | 0.1                | 0.1                    | 39.5       | 56                             | -16.5  | -                           | -      |
| 1.4955                   | 21.09         | Av        | 0.1                | 0.1                    | 21.29      | -                              | -      | 46                          | -24.71 |
| 3.129                    | 35.94         | PK        | 0.1                | 0.1                    | 36.14      | 56                             | -19.86 | -                           | -      |
| 3.129                    | 19.07         | Av        | 0.1                | 0.1                    | 19.27      | -                              | -      | 46                          | -26.73 |
| 6.7605                   | 34.77         | PK        | 0.1                | 0.1                    | 34.97      | 60                             | -25.03 | -                           | -      |
| 6.7605                   | 19.45         | Av        | 0.1                | 0.1                    | 19.65      | -                              | -      | 50                          | -30.35 |
| 7.575                    | 35.39         | PK        | 0.1                | 0.1                    | 35.59      | 60                             | -24.41 | -                           | -      |
| 7.575                    | 19.47         | Av        | 0.1                | 0.1                    | 19.67      | -                              | -      | 50                          | -30.33 |
| 21.6645                  | 29.16         | PK        | 0.3                | 0.2                    | 29.66      | 60                             | -30.34 | -                           | -      |
| 21.6645                  | 12.29         | Av        | 0.3                | 0.2                    | 12.79      | -                              | -      | 50                          | -37.21 |
| Line-L2 .15 - 30MHz      |               |           |                    |                        |            |                                |        |                             |        |
| 0.339                    | 37.75         | PK        | 0.1                | 0                      | 37.85      | 59.2                           | -21.35 | -                           | -      |
| 0.339                    | 21            | Av        | 0.1                | 0                      | 21.1       | -                              | -      | 49.2                        | -28.1  |
| 0.9735                   | 33.54         | PK        | 0.1                | 0.1                    | 33.74      | 56                             | -22.26 | -                           | -      |
| 0.9735                   | 14.34         | Av        | 0.1                | 0.1                    | 14.54      | -                              | -      | 46                          | -31.46 |
| 1.3965                   | 37.31         | PK        | 0.1                | 0.1                    | 37.51      | 56                             | -18.49 | -                           | -      |
| 1.3965                   | 20.24         | Av        | 0.1                | 0.1                    | 20.44      | -                              | -      | 46                          | -25.56 |
| 2.283                    | 35.4          | PK        | 0.1                | 0.1                    | 35.6       | 56                             | -20.4  | -                           | -      |
| 2.283                    | 19.02         | Av        | 0.1                | 0.1                    | 19.22      | -                              | -      | 46                          | -26.78 |
| 5.937                    | 35.04         | PK        | 0.1                | 0.1                    | 35.24      | 60                             | -24.76 | -                           | -      |
| 5.937                    | 16.81         | Av        | 0.1                | 0.1                    | 17.01      | -                              | -      | 50                          | -32.99 |
| 23.5635                  | 36.46         | PK        | 0.4                | 0.2                    | 37.06      | 60                             | -22.94 | -                           | -      |
| 23.5635                  | 15.4          | Av        | 0.4                | 0.2                    | 16         | -                              | -      | 50                          | -34    |
|                          |               |           |                    |                        |            |                                |        |                             |        |
| PK - Peak detector       |               |           |                    |                        |            |                                |        |                             |        |
| QP - Quasi-Peak detector |               |           |                    |                        |            |                                |        |                             |        |
| Av - Average detector    |               |           |                    |                        |            |                                |        |                             |        |

**LINE 1 RESULTS**



**LINE 2 RESULTS**

