



**FCC CFR47 PART 15 SUBPART C**

**CLASS II PERMISSIVE CHANGE  
TEST REPORT**

**FOR**

**802.11 b/g/n Radio Module with 2.4GHz Whip Antenna**

**MODEL NUMBER: WL11D**

**FCC ID: ACJ9TGWL11D**

**REPORT NUMBER: 11J13842-1**

**ISSUE DATE: JUNE 22, 2011**

*Prepared for*

**PANASONIC CORPORATION OF NORTH AMERICA  
ONE PANASONIC WAY, 4B-8  
SECAUCUS, NEW JERSEY 07094, U.S.A.**

*Prepared by*

**COMPLIANCE CERTIFICATION SERVICES (UL CCS)  
47173 BENICIA STREET  
FREMONT, CA 94538, U.S.A.  
TEL: (510) 771-1000  
FAX: (510) 661-0888**



**NVLAP LAB CODE 200065-0**

Revision History

| Rev. | Issue<br>Date | Revisions     | Revised By |
|------|---------------|---------------|------------|
| --   | 06/22/11      | Initial Issue | F. Ibrahim |

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** PANASONIC CORPORATION OF NORTH AMERICA  
ONE PANASONIC WAY, 4B-8  
SECAUCUS, NEW JERSEY 07094, U.S.A.

**EUT DESCRIPTION:** 802.11 b/g/n Radio Module with 2.4GHz Whip Antenna

**MODEL:** WL11D

**SERIAL NUMBER:** N/A

**DATE TESTED:** JUNE 20-21, 2011

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

Compliance Certification Services (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:



FRANK IBRAHIM  
EMC SUPERVISOR  
UL CCS

Tested By:



TOM CHEN  
EMC ENGINEER  
UL CCS

## 2. TEST METHODOLOGY

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

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

### 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 802.11b/g/n is an Atheros Communications AR5B95, 802.11n 1x1 PCIe Minicard Transceiver that operates in the 2.4GHz. The card supports 1x1 for 802.11n in both the 20MHz and 40MHz channels and in legacy modes is supported.

The radio module is manufactured by Atheros.

### **5.2. DESCRIPTION OF CLASS II PERMISSIVE CHANGE**

The major change filed under this application is adding external antenna.

### **5.3. MAXIMUM OUTPUT POWER**

Same power values were used from original report;( Report No 81029005).

### **5.4. DESCRIPTION OF AVAILABLE ANTENNAS**

Whip antenna with 5dBi in 2.4GHz is added.

### **5.5. SOFTWARE AND FIRMWARE**

The test utility software used during testing was Atheros ART R0.9 B34.

### **5.6. WORST-CASE CONFIGURATION AND MODE**

The worst-case channel is determined as the channel with the highest output power. Radiated Emissions below 1 GHz was performed with EUT set to transmit at the channel with highest output power.

Worst-case data rates used per input from the client are as follows:

11b: 1Mbps  
11g: 6 Mbps  
11n HT20: MCS0 6.5Mbps.  
11n HT40: MCS0 13.5Mbps

## 5.6 DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

| PERIPHERAL SUPPORT EQUIPMENT LIST |              |                   |                  |        |
|-----------------------------------|--------------|-------------------|------------------|--------|
| Description                       | Manufacturer | Model             | Serial Number    | FCC ID |
| Laptop                            | Panasonic    | Toughbook (CF-31) | CF31JEGAXMM      | DoC    |
| Laptop Deck                       | Panasonic    | CF-VEB272         | 9DKSA 02245      | DoC    |
| AC/DC                             | Panasonic    | CF-AA5713A M1     | 5713AM110Z12971A | DoC    |

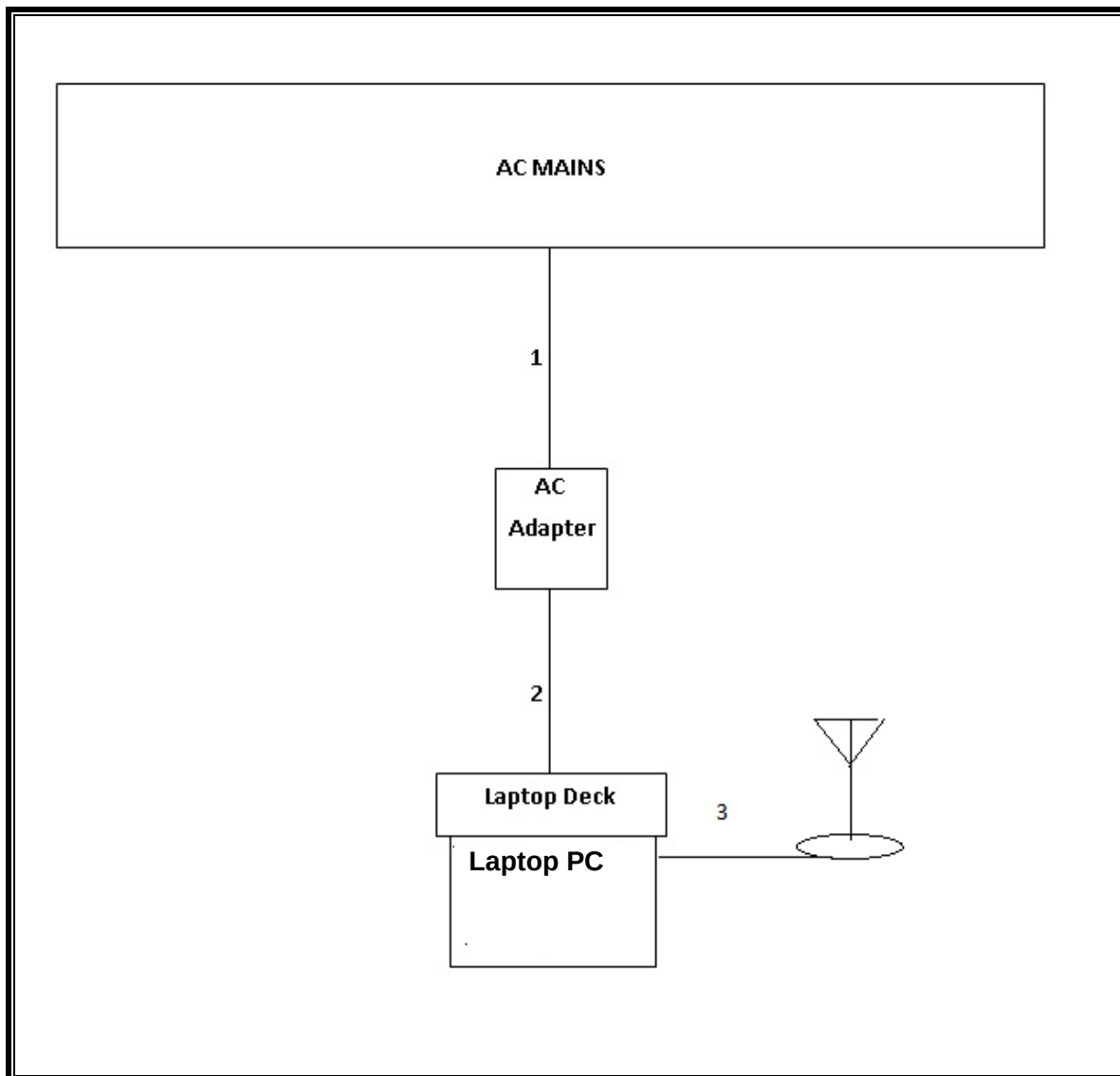
### I/O CABLES

| I/O CABLE LIST |      |                      |                |             |              |         |
|----------------|------|----------------------|----------------|-------------|--------------|---------|
| Cable No.      | Port | # of Identical Ports | Connector Type | Cable Type  | Cable Length | Remarks |
| 1              | AC   | 1                    | AC             | Un-Sheilded | 180 cm       | N/A     |
| 2              | DC   | 1                    | DC             | Un-Sheilded | 180 cm       | N/A     |
| 3              | ANT  | 1                    | SMA            | Sheilded    | 90 cm        | N/A     |

### TEST SETUP

The EUT is installed in a host laptop computer during the tests. Test software exercised the radio card. A laptop computer was used to configure the EUT to continuously transmit at a specified output power or continuously receive on the channel specified in the test data. For transmit modes the worst case was evaluated.

**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 Date | Cal Due  |
| Antenna, Bilog, 2 GHz       | Sunol Sciences | JB1           | C01016 | 07/12/10 | 07/12/11 |
| Antenna, Horn, 18 GHz       | EMCO           | 3115          | C00783 | 06/29/10 | 06/29/11 |
| Preamplifier, 26.5 GHz      | Agilent / HP   | 8449B         | C01063 | 07/14/10 | 07/14/11 |
| Preamplifier, 1300 MHz      | Agilent / HP   | 8447D         | C00580 | 01/27/11 | 01/27/12 |
| Reject Filter, 2.4-2.5 GHz  | Micro-Tronics  | BRC13192      | N02683 |          | CNR      |
| EMI Test Receiver, 30 MHz   | R & S          | ESHS 20       | N02396 | 06/08/11 | 06/05/13 |
| Spectrum Analyzer, 26.5 GHz | Agilent / HP   | E4440A        | C01178 | 08/30/10 | 08/30/11 |
| LISN, 30 MHz                | FCC            | LISN-50/250-2 | N02625 | 11/10/10 | 11/10/11 |

## 7. RADIATED TEST RESULTS

### 7.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

| 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. 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 10 Hz 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.

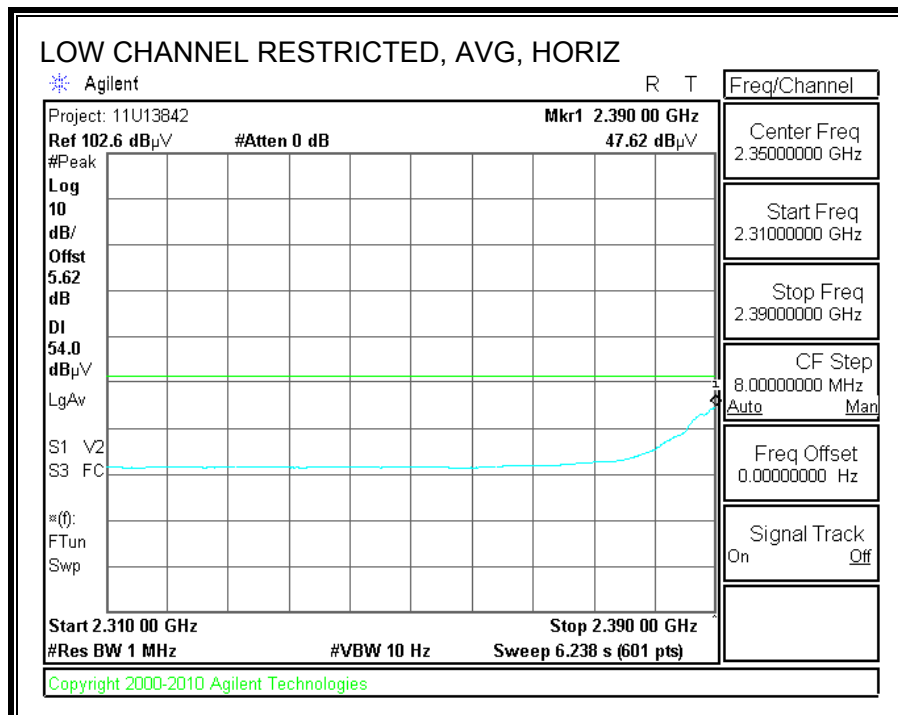
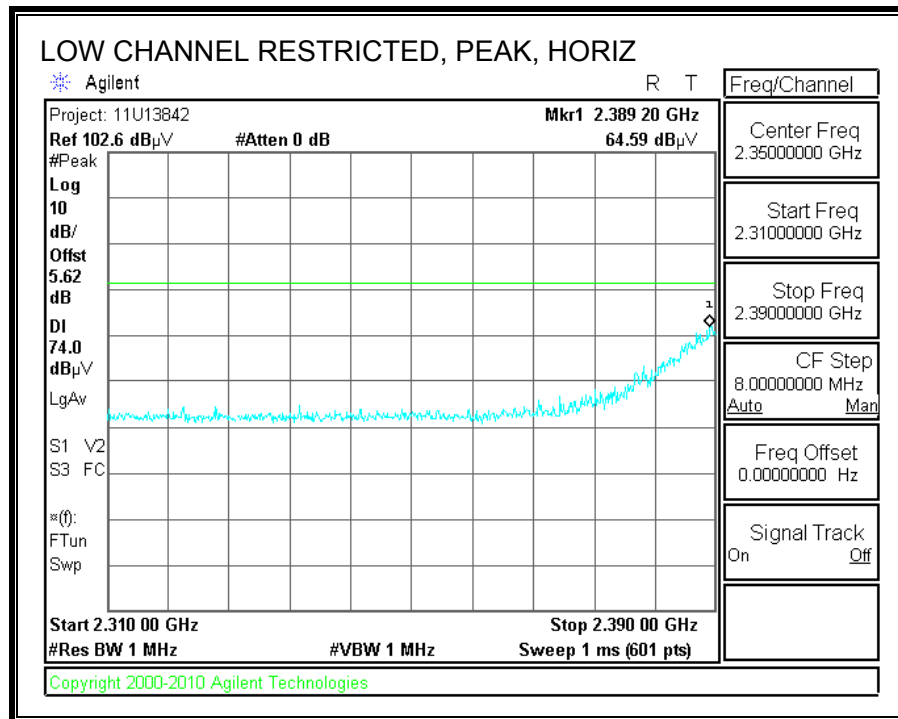
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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.

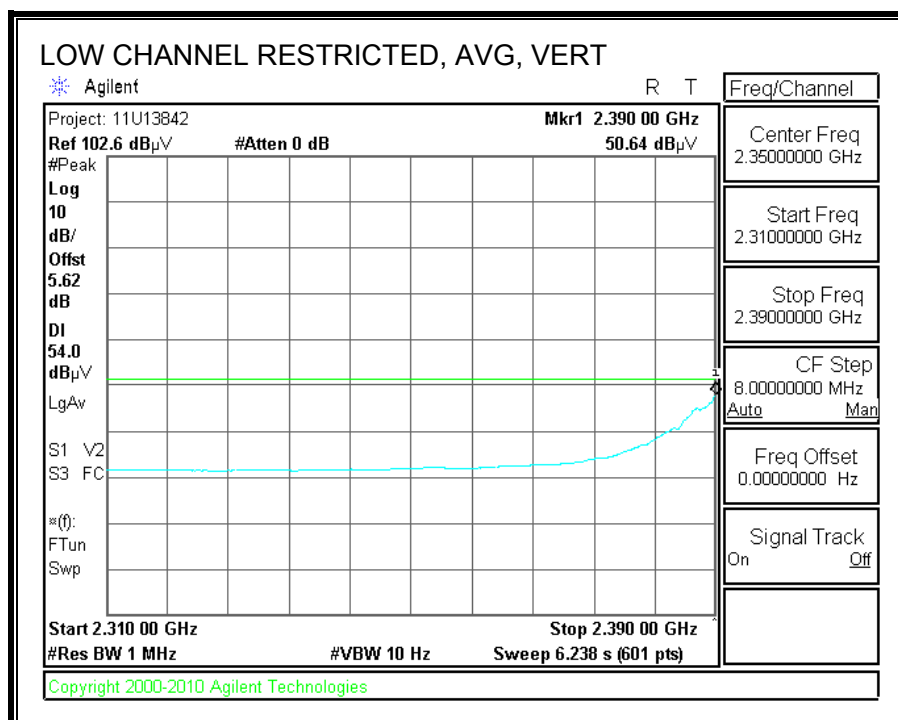
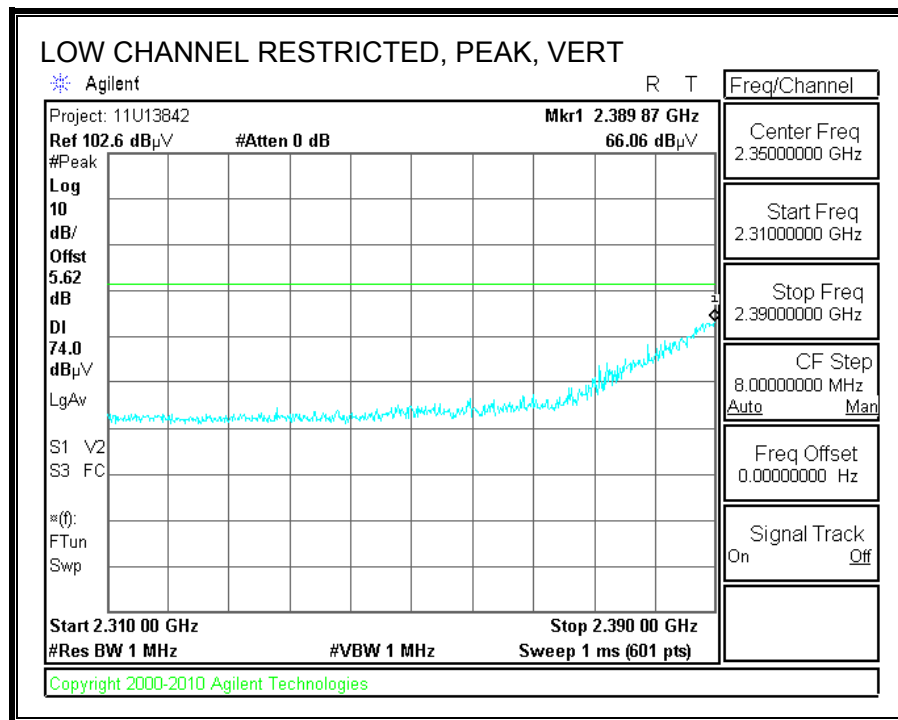
## 7.2. TRANSMITTER ABOVE 1 GHz (worst-case modes)

### 7.2.1. 2.4 GHz BAND b MODE

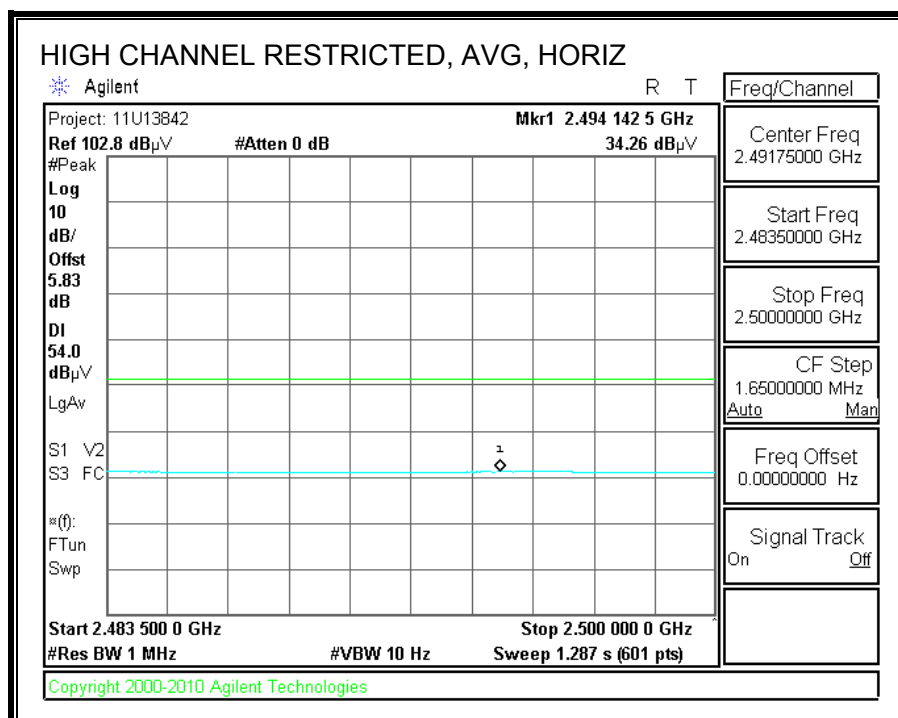
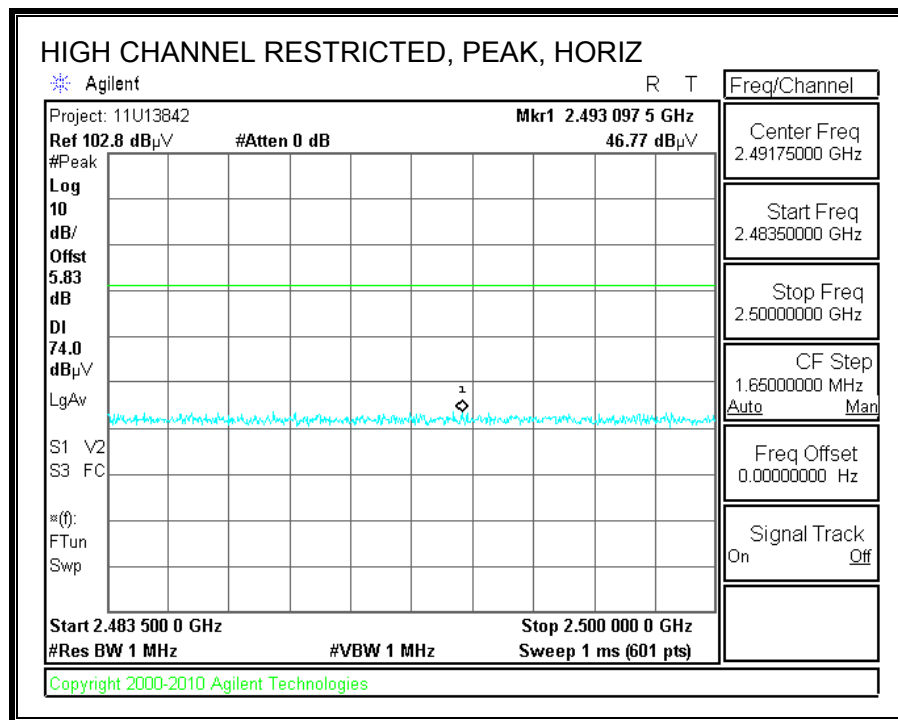
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



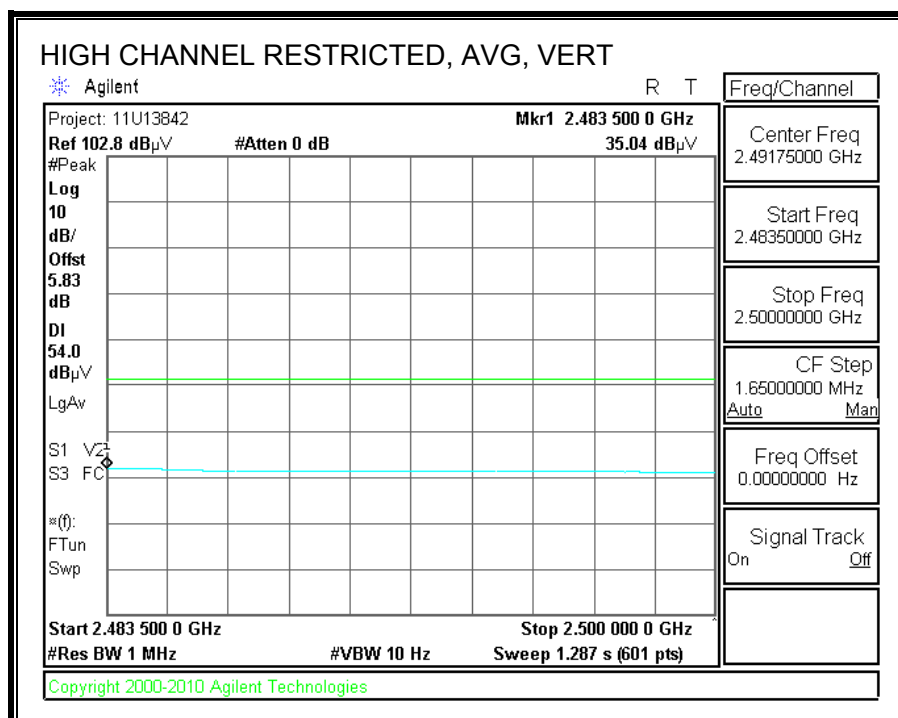
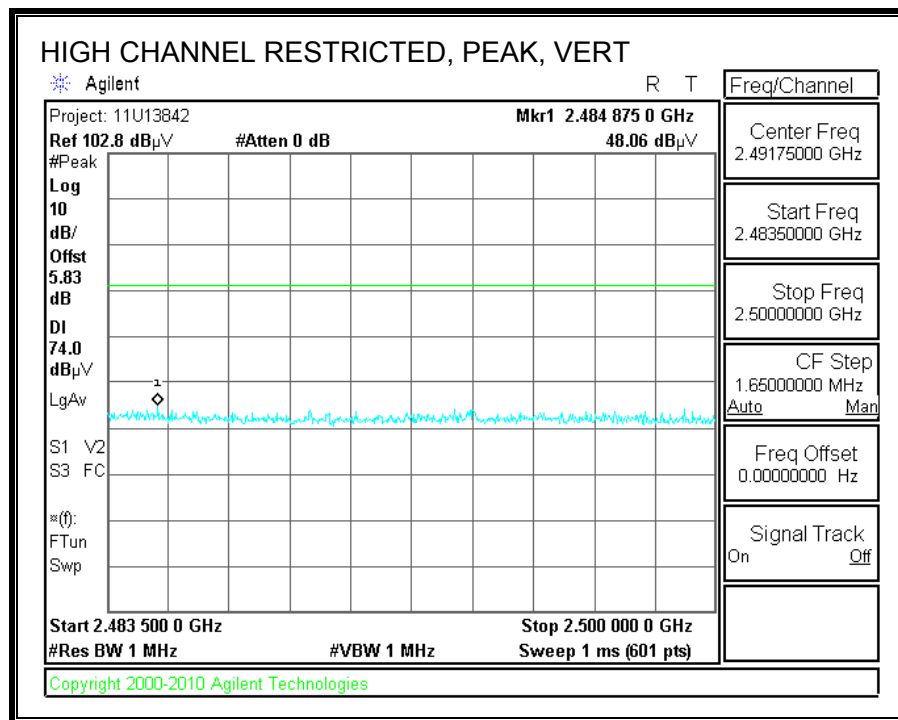
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



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



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

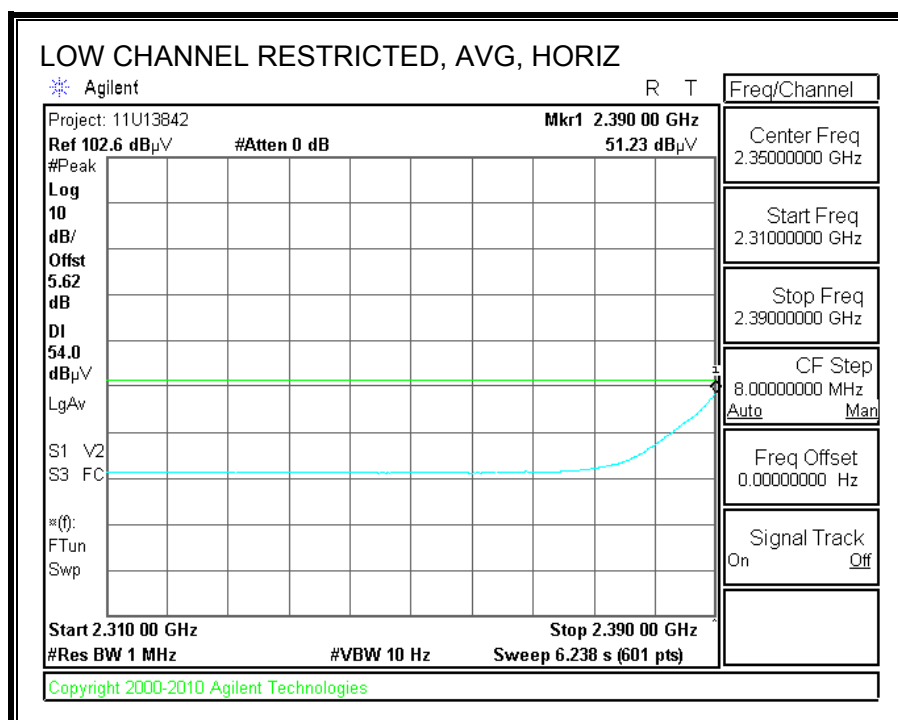
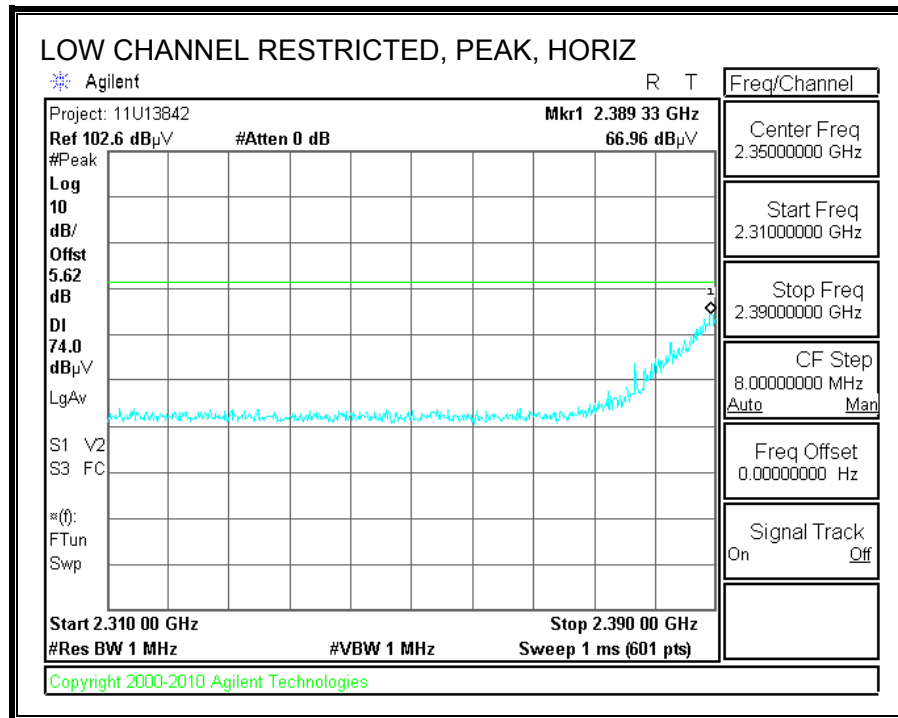


# HARMONICS AND SPURIOUS EMISSIONS

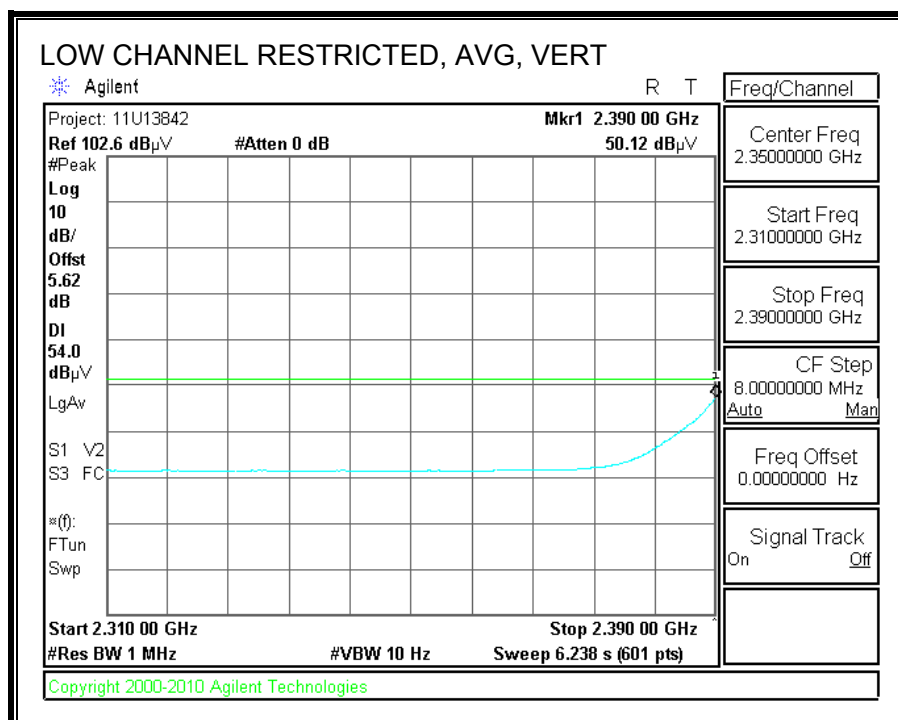
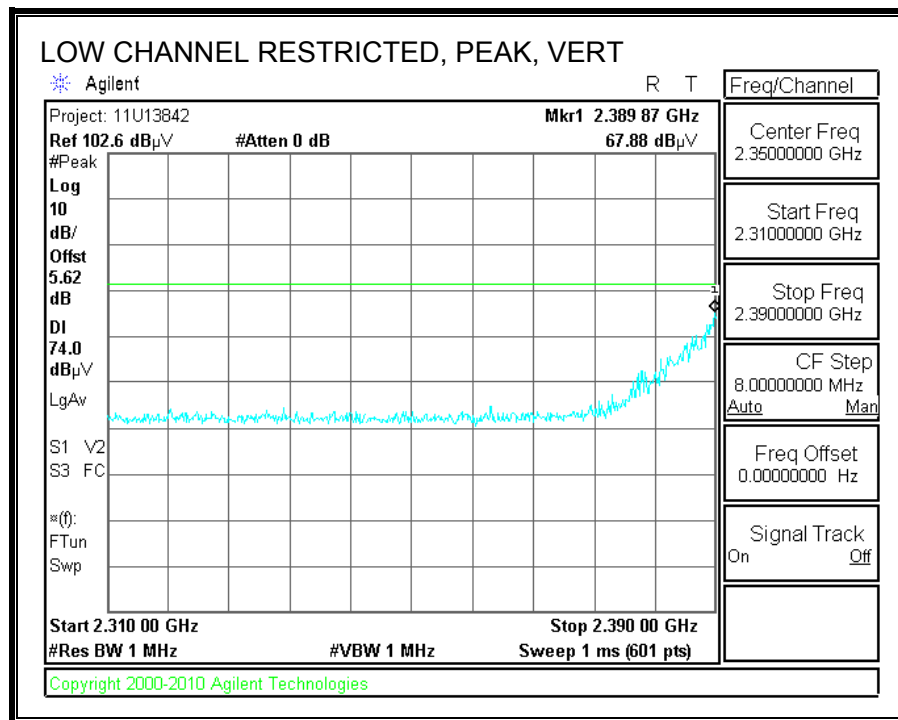
|                                                                                     |                       |              |            |                                |           |                              |             |                 |                 |              |                 |                |       |
|-------------------------------------------------------------------------------------|-----------------------|--------------|------------|--------------------------------|-----------|------------------------------|-------------|-----------------|-----------------|--------------|-----------------|----------------|-------|
| High Frequency Measurement<br>Compliance Certification Services, Fremont 5m Chamber |                       |              |            |                                |           |                              |             |                 |                 |              |                 |                |       |
| Test Engr:                                                                          |                       | Tom Chen     |            |                                |           |                              |             |                 |                 |              |                 |                |       |
| Date:                                                                               |                       | 06/20/11     |            |                                |           |                              |             |                 |                 |              |                 |                |       |
| Project #:                                                                          |                       | 11J13842     |            |                                |           |                              |             |                 |                 |              |                 |                |       |
| Company:                                                                            |                       | Panasonic    |            |                                |           |                              |             |                 |                 |              |                 |                |       |
| Test Target:                                                                        |                       | FCC Class B  |            |                                |           |                              |             |                 |                 |              |                 |                |       |
| Mode Oper:                                                                          |                       | b mode, TX   |            |                                |           |                              |             |                 |                 |              |                 |                |       |
|                                                                                     |                       |              |            |                                |           |                              |             |                 |                 |              |                 |                |       |
| f                                                                                   | Measurement Frequency |              | Amp        | Preamp Gain                    |           | Average Field Strength Limit |             |                 |                 |              |                 |                |       |
| Dist                                                                                | Distance to Antenna   |              | D Corr     | Distance Correct to 3 meters   |           | Peak Field Strength Limit    |             |                 |                 |              |                 |                |       |
| Read                                                                                | Analyzer Reading      |              | Avg        | Average Field Strength @ 3 m   |           | Margin vs. Average Limit     |             |                 |                 |              |                 |                |       |
| AF                                                                                  | Antenna Factor        |              | Peak       | Calculated Peak Field Strength |           | Margin vs. Peak Limit        |             |                 |                 |              |                 |                |       |
| CL                                                                                  | Cable Loss            |              | HPF        | High Pass Filter               |           |                              |             |                 |                 |              |                 |                |       |
|                                                                                     |                       |              |            |                                |           |                              |             |                 |                 |              |                 |                |       |
| f<br>GHz                                                                            | Dist<br>(m)           | Read<br>dBuV | AF<br>dB/m | CL<br>dB                       | Amp<br>dB | D Corr<br>dB                 | Filtr<br>dB | Corr.<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Ant. Pol<br>V/H | Det.<br>P/A/QP | Notes |
| 2412 MHz, b mode                                                                    |                       |              |            |                                |           |                              |             |                 |                 |              |                 |                |       |
| 4.824                                                                               | 3.0                   | 37.4         | 32.7       | 5.8                            | -34.8     | 0.0                          | 0.0         | 41.0            | 74.0            | -33.0        | H               | P              |       |
| 4.824                                                                               | 3.0                   | 29.0         | 32.7       | 5.8                            | -34.8     | 0.0                          | 0.0         | 32.6            | 54.0            | -21.4        | H               | A              |       |
| 4.824                                                                               | 3.0                   | 36.4         | 32.7       | 5.8                            | -34.8     | 0.0                          | 0.0         | 40.1            | 74.0            | -33.9        | V               | P              |       |
| 4.824                                                                               | 3.0                   | 26.1         | 32.7       | 5.8                            | -34.8     | 0.0                          | 0.0         | 29.7            | 54.0            | -24.3        | V               | A              |       |
| 2437 MHz, b mode                                                                    |                       |              |            |                                |           |                              |             |                 |                 |              |                 |                |       |
| 4.874                                                                               | 3.0                   | 43.1         | 32.7       | 5.8                            | -34.8     | 0.0                          | 0.0         | 46.8            | 74.0            | -27.2        | V               | P              |       |
| 4.874                                                                               | 3.0                   | 39.4         | 32.7       | 5.8                            | -34.8     | 0.0                          | 0.0         | 43.1            | 54.0            | -10.9        | V               | A              |       |
| 4.874                                                                               | 3.0                   | 46.3         | 32.7       | 5.8                            | -34.8     | 0.0                          | 0.0         | 50.0            | 74.0            | -24.0        | H               | P              |       |
| 4.874                                                                               | 3.0                   | 44.1         | 32.7       | 5.8                            | -34.8     | 0.0                          | 0.0         | 47.8            | 54.0            | -6.2         | H               | A              |       |
| 2462 MHz, b mode                                                                    |                       |              |            |                                |           |                              |             |                 |                 |              |                 |                |       |
| 4.924                                                                               | 3.0                   | 41.7         | 32.7       | 5.9                            | -34.8     | 0.0                          | 0.0         | 45.5            | 74.0            | -28.5        | H               | P              |       |
| 4.924                                                                               | 3.0                   | 37.5         | 32.7       | 5.9                            | -34.8     | 0.0                          | 0.0         | 41.3            | 54.0            | -12.7        | H               | A              |       |
| 7.386                                                                               | 3.0                   | 35.1         | 35.6       | 7.3                            | -34.1     | 0.0                          | 0.0         | 43.9            | 74.0            | -30.1        | H               | P              |       |
| 7.386                                                                               | 3.0                   | 23.3         | 35.6       | 7.3                            | -34.1     | 0.0                          | 0.0         | 32.1            | 54.0            | -21.9        | H               | A              |       |
| 4.924                                                                               | 3.0                   | 39.0         | 32.7       | 5.9                            | -34.8     | 0.0                          | 0.0         | 42.8            | 74.0            | -31.2        | V               | P              |       |
| 4.924                                                                               | 3.0                   | 31.7         | 32.7       | 5.9                            | -34.8     | 0.0                          | 0.0         | 35.5            | 54.0            | -18.5        | V               | A              |       |
| Rev. 4.1.2.7                                                                        |                       |              |            |                                |           |                              |             |                 |                 |              |                 |                |       |
| Note: No other emissions were detected above the system noise floor.                |                       |              |            |                                |           |                              |             |                 |                 |              |                 |                |       |

## 7.2.2. 2.4 GHz BAND g MODE

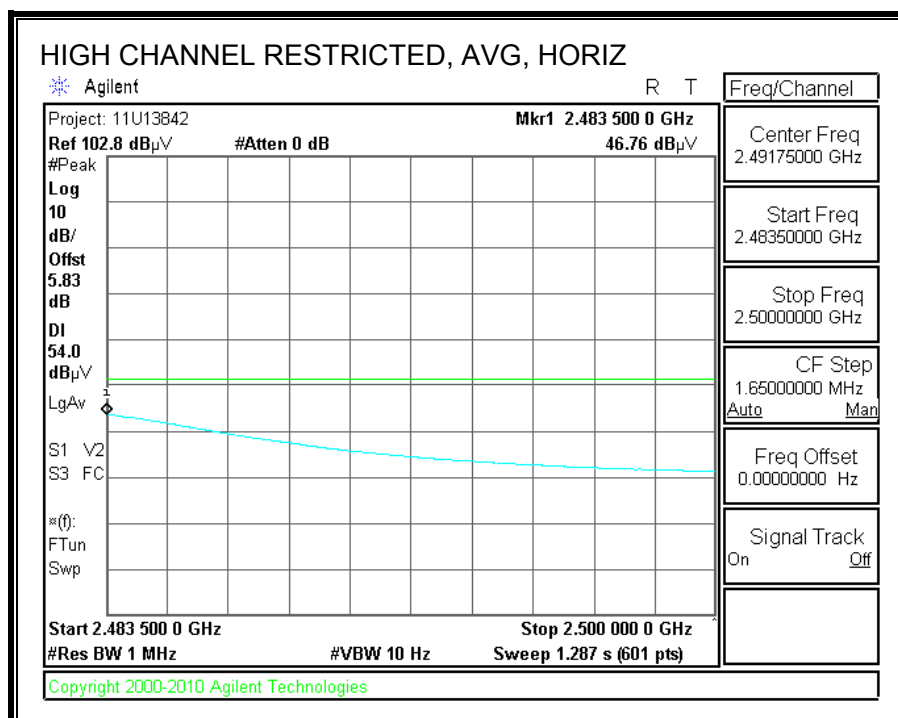
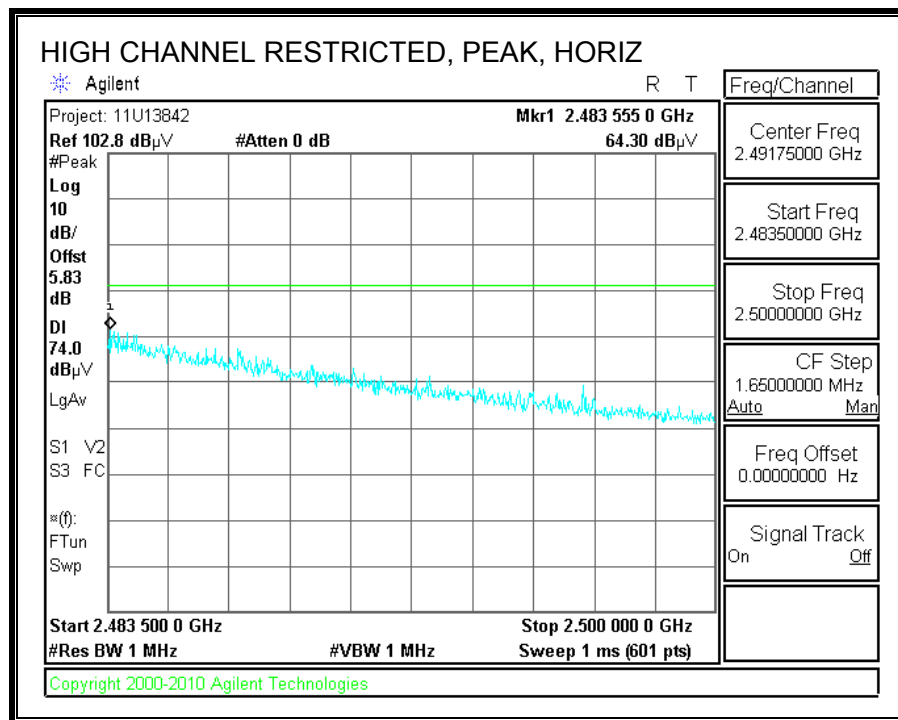
### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



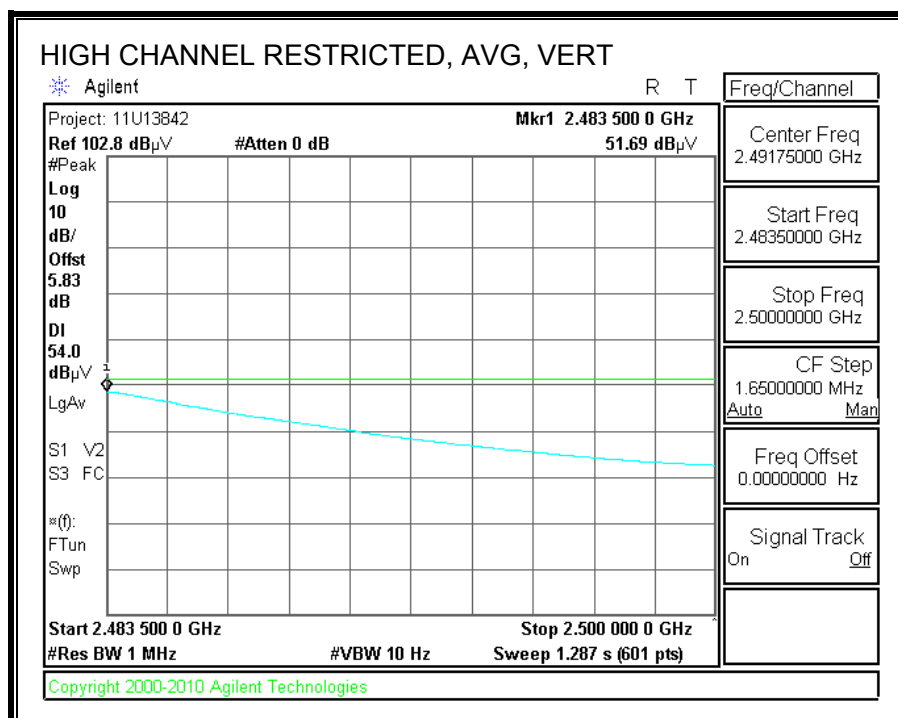
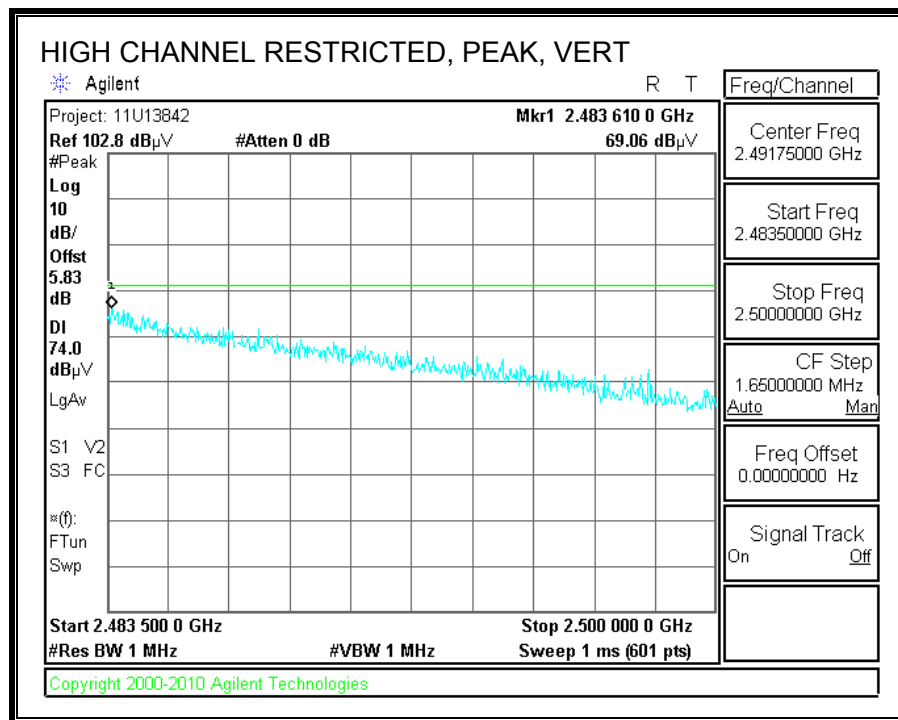
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



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



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

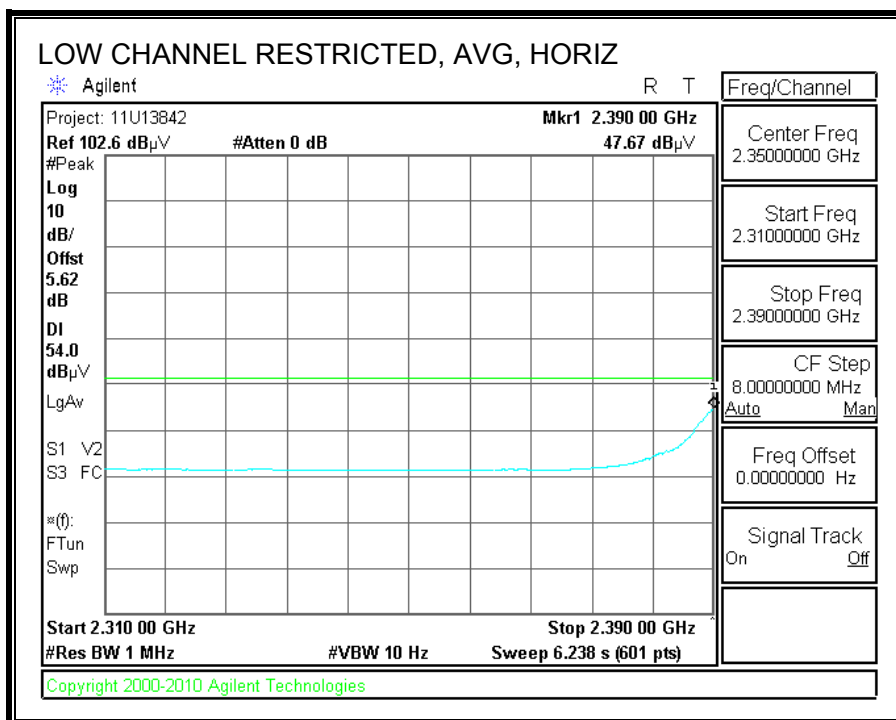
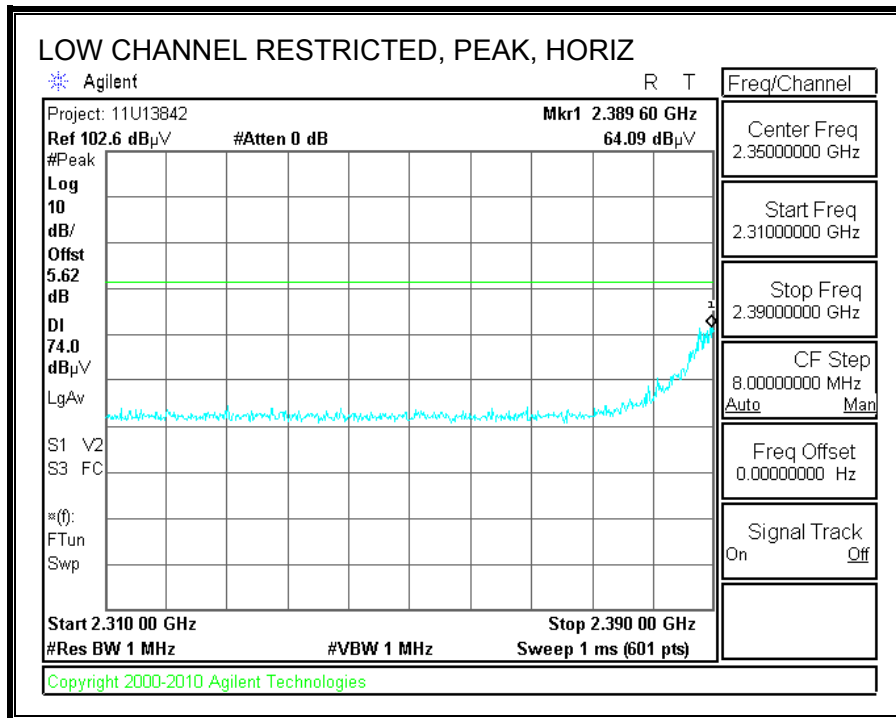


# **HARMONICS AND SPURIOUS EMISSIONS**

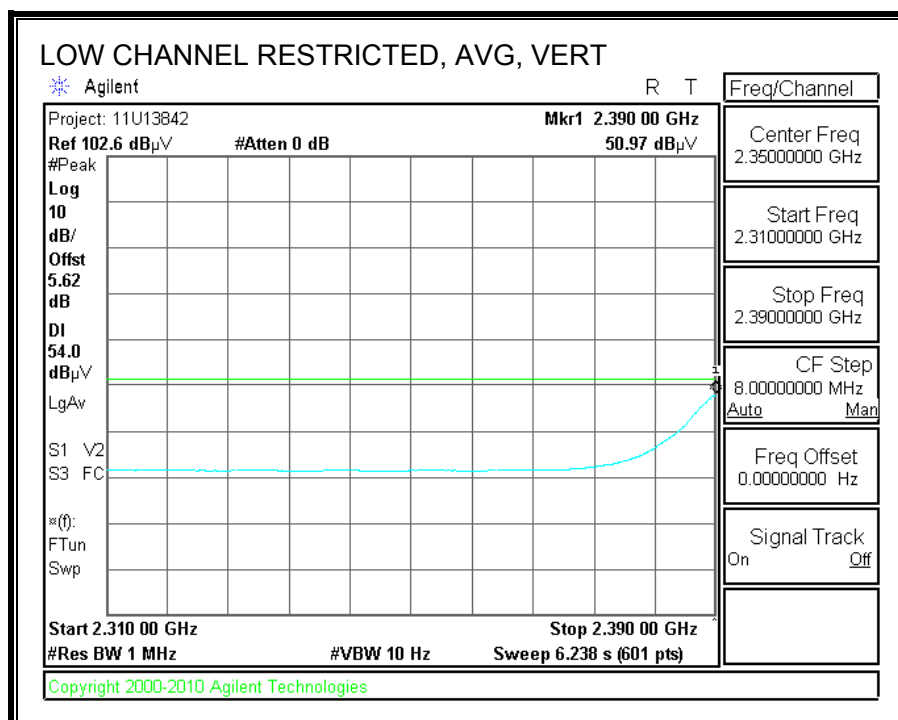
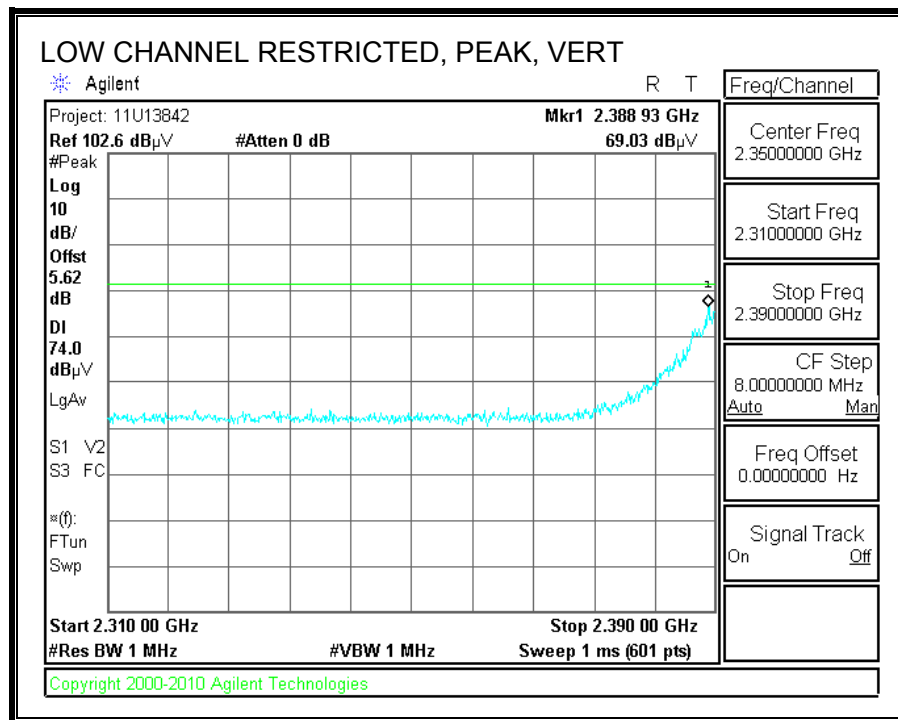
| <b>High Frequency Measurement</b><br><b>Compliance Certification Services, Fremont 5m Chamber</b> |                       |              |                                |                              |           |              |            |                 |                 |              |                 |                |       |
|---------------------------------------------------------------------------------------------------|-----------------------|--------------|--------------------------------|------------------------------|-----------|--------------|------------|-----------------|-----------------|--------------|-----------------|----------------|-------|
| Test Engr:                                                                                        |                       | Tom Chen     |                                |                              |           |              |            |                 |                 |              |                 |                |       |
| Date:                                                                                             |                       | 06/20/11     |                                |                              |           |              |            |                 |                 |              |                 |                |       |
| Project #:                                                                                        |                       | 11J13842     |                                |                              |           |              |            |                 |                 |              |                 |                |       |
| Company:                                                                                          |                       | Panasonic    |                                |                              |           |              |            |                 |                 |              |                 |                |       |
| Test Target:                                                                                      |                       | FCC Class B  |                                |                              |           |              |            |                 |                 |              |                 |                |       |
| Mode Oper:                                                                                        |                       | g mode, TX   |                                |                              |           |              |            |                 |                 |              |                 |                |       |
| f                                                                                                 | Measurement Frequency | Amp          | Preamp Gain                    | Average Field Strength Limit |           |              |            |                 |                 |              |                 |                |       |
| Dist                                                                                              | Distance to Antenna   | D Corr       | Distance Correct to 3 meters   | Peak Field Strength Limit    |           |              |            |                 |                 |              |                 |                |       |
| Read                                                                                              | Analyzer Reading      | Avg          | Average Field Strength @ 3 m   | Margin vs. Average Limit     |           |              |            |                 |                 |              |                 |                |       |
| AF                                                                                                | Antenna Factor        | Peak         | Calculated Peak Field Strength | Margin vs. Peak Limit        |           |              |            |                 |                 |              |                 |                |       |
| CL                                                                                                | Cable Loss            | HPF          | High Pass Filter               |                              |           |              |            |                 |                 |              |                 |                |       |
| f<br>GHz                                                                                          | Dist<br>(m)           | Read<br>dBuV | AF<br>dB/m                     | CL<br>dB                     | Amp<br>dB | D Corr<br>dB | Fitr<br>dB | Corr.<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Ant. Pol<br>V/H | Det.<br>P/A/QP | Notes |
| <b>2412 MHz, g mode</b>                                                                           |                       |              |                                |                              |           |              |            |                 |                 |              |                 |                |       |
| 4.824                                                                                             | 3.0                   | 38.7         | 32.7                           | 5.8                          | -34.8     | 0.0          | 0.0        | 42.3            | 74.0            | -31.7        | H               | P              |       |
| 4.824                                                                                             | 3.0                   | 25.6         | 32.7                           | 5.8                          | -34.8     | 0.0          | 0.0        | 29.2            | 54.0            | -24.8        | H               | A              |       |
| 4.824                                                                                             | 3.0                   | 35.6         | 32.7                           | 5.8                          | -34.8     | 0.0          | 0.0        | 39.2            | 74.0            | -34.8        | V               | P              |       |
| 4.824                                                                                             | 3.0                   | 23.9         | 32.7                           | 5.8                          | -34.8     | 0.0          | 0.0        | 27.5            | 54.0            | -26.5        | V               | A              |       |
| <b>2437 MHz, g mode</b>                                                                           |                       |              |                                |                              |           |              |            |                 |                 |              |                 |                |       |
| 4.874                                                                                             | 3.0                   | 41.8         | 32.7                           | 5.8                          | -34.8     | 0.0          | 0.0        | 45.5            | 74.0            | -28.5        | V               | P              |       |
| 4.874                                                                                             | 3.0                   | 29.3         | 32.7                           | 5.8                          | -34.8     | 0.0          | 0.0        | 33.0            | 54.0            | -21.0        | V               | A              |       |
| 4.874                                                                                             | 3.0                   | 48.7         | 32.7                           | 5.8                          | -34.8     | 0.0          | 0.0        | 52.4            | 74.0            | -21.6        | H               | P              |       |
| 4.874                                                                                             | 3.0                   | 35.6         | 32.7                           | 5.8                          | -34.8     | 0.0          | 0.0        | 39.3            | 54.0            | -14.7        | H               | A              |       |
| <b>2462 MHz, g mode</b>                                                                           |                       |              |                                |                              |           |              |            |                 |                 |              |                 |                |       |
| 4.924                                                                                             | 3.0                   | 38.3         | 32.7                           | 5.9                          | -34.8     | 0.0          | 0.0        | 42.1            | 74.0            | -31.9        | V               | P              |       |
| 4.924                                                                                             | 3.0                   | 25.7         | 32.7                           | 5.9                          | -34.8     | 0.0          | 0.0        | 29.5            | 54.0            | -24.5        | V               | A              |       |
| 4.924                                                                                             | 3.0                   | 42.7         | 32.7                           | 5.9                          | -34.8     | 0.0          | 0.0        | 46.5            | 74.0            | -27.5        | H               | P              |       |
| 4.924                                                                                             | 3.0                   | 28.8         | 32.7                           | 5.9                          | -34.8     | 0.0          | 0.0        | 32.6            | 54.0            | -21.4        | H               | A              |       |
| Rev. 4.1.2.7                                                                                      |                       |              |                                |                              |           |              |            |                 |                 |              |                 |                |       |
| Note: No other emissions were detected above the system noise floor.                              |                       |              |                                |                              |           |              |            |                 |                 |              |                 |                |       |

### 7.2.3. 2.4 GHz BAND 11n HT20 MODE

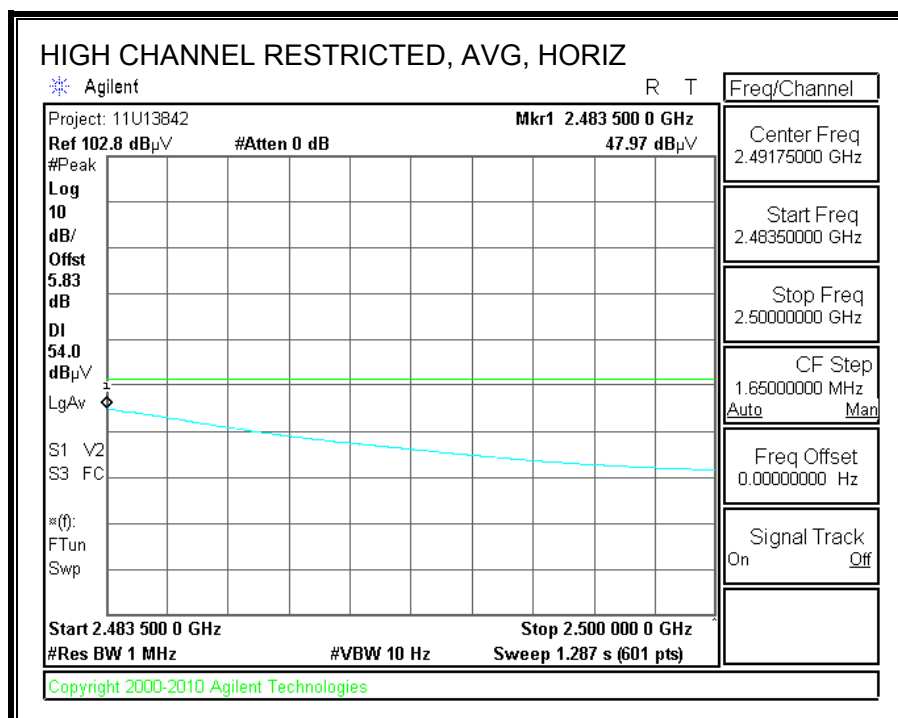
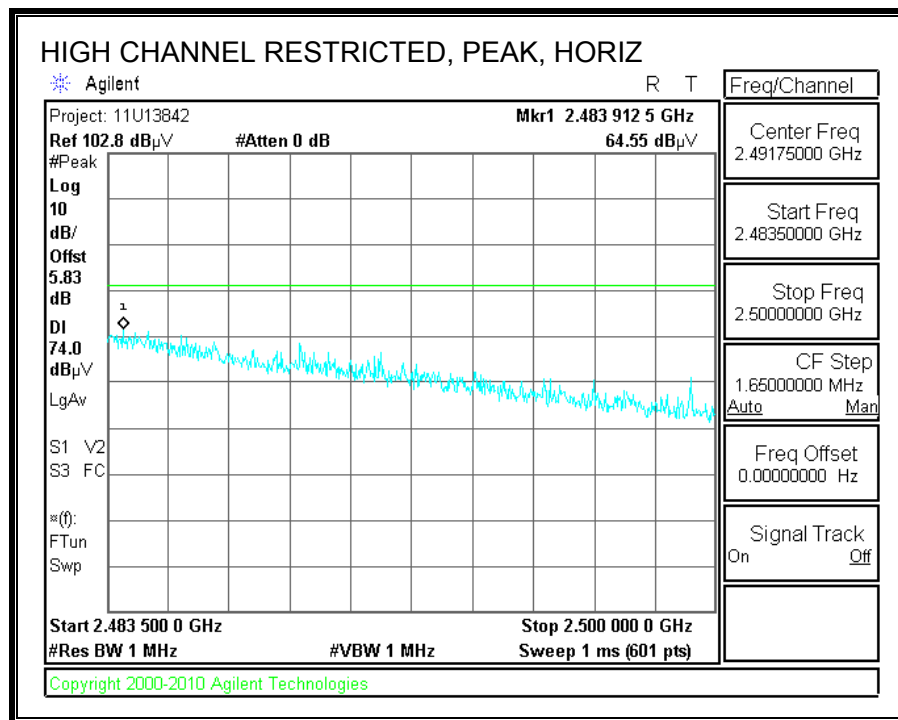
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



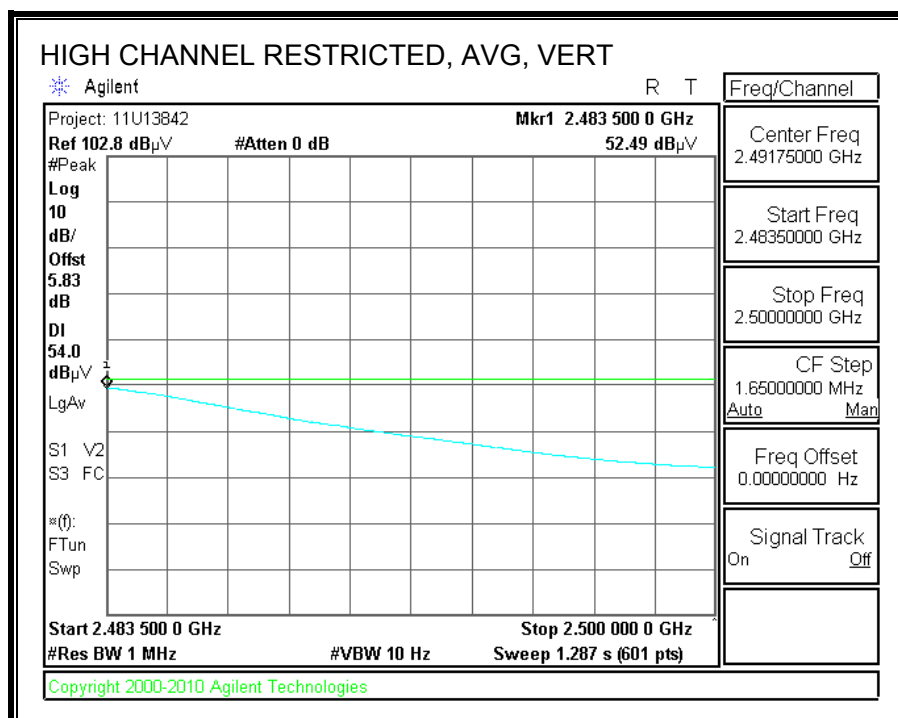
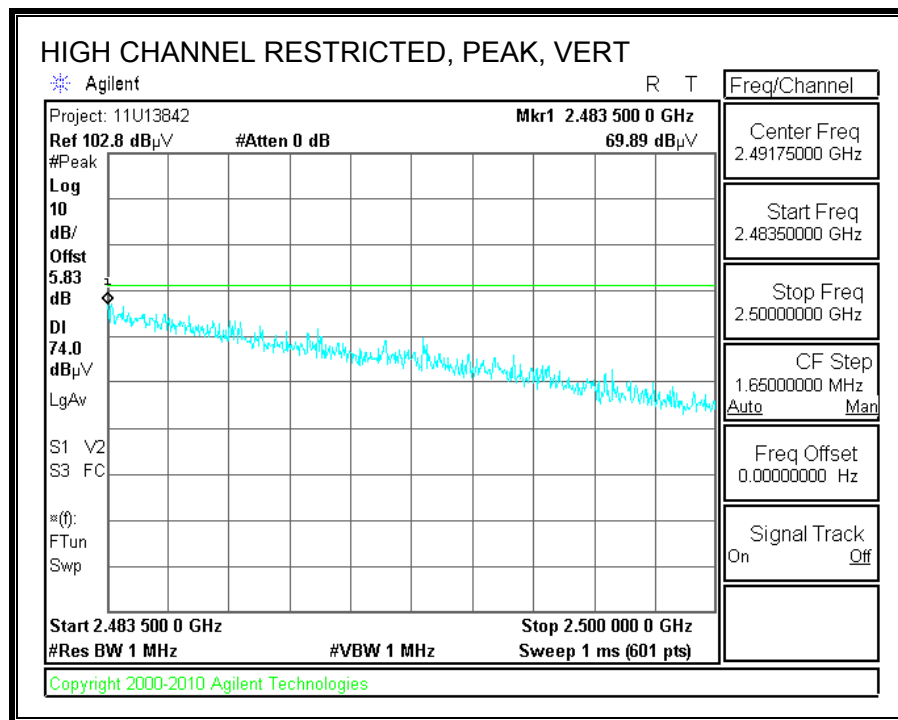
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



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



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



# HARMONICS AND SPURIOUS EMISSIONS

Test Engr: Tom Chen  
Date: 06/21/11  
Project #: 11J13842  
Company: Panasonic  
Test Target: FCC Class B  
Mode Oper: HT20 ,TX mode

f Measurement Frequency Amp Preamp Gain Average Field Strength Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Limit  
Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Limit  
AF Antenna Factor Peak Calculated Peak Field Strength Margin vs. Peak Limit  
CL Cable Loss HPF High Pass Filter

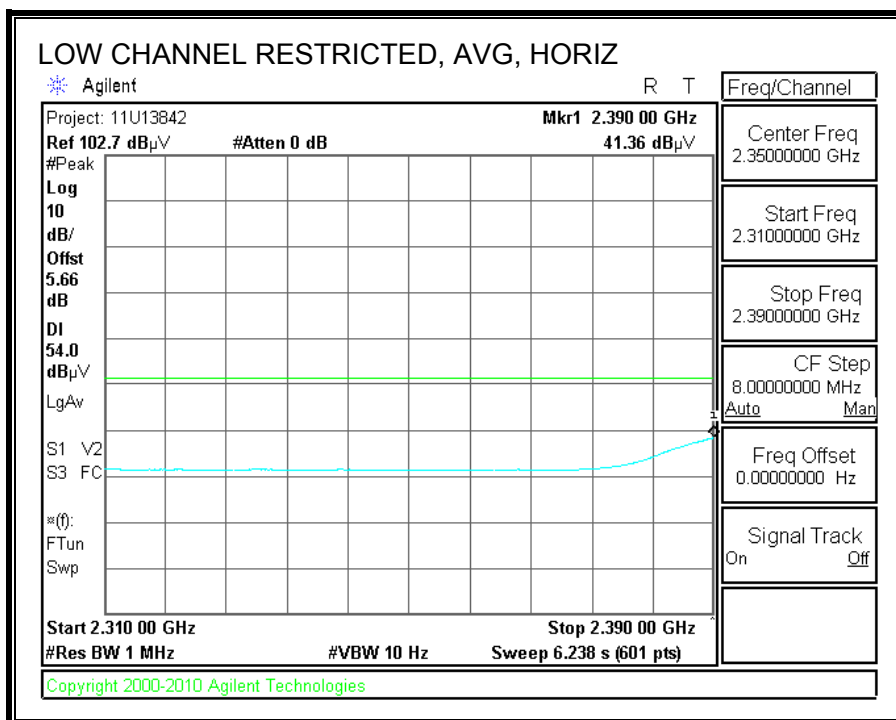
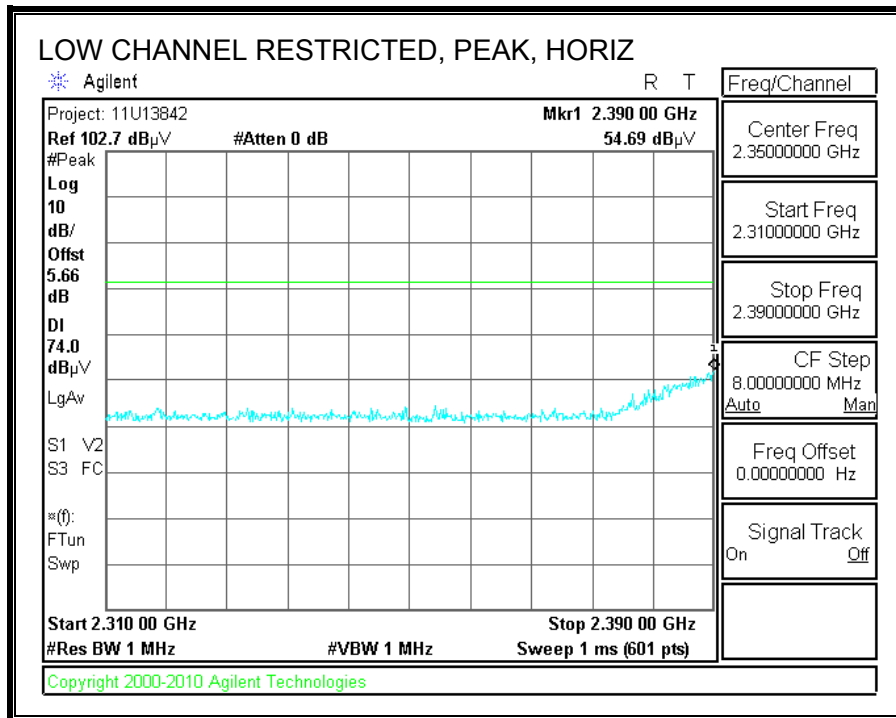
| f<br>GHz              | Dist<br>(m) | Read<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | Fitr<br>dB | Corr.<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Ant. Pol<br>V/H | Det.<br>P/A/QP | Notes |
|-----------------------|-------------|--------------|------------|----------|-----------|--------------|------------|-----------------|-----------------|--------------|-----------------|----------------|-------|
| <b>2412 MHz, HT20</b> |             |              |            |          |           |              |            |                 |                 |              |                 |                |       |
| 4.824                 | 3.0         | 37.2         | 32.7       | 5.8      | -34.8     | 0.0          | 0.0        | 40.9            | 74.0            | -33.1        | H               | P              |       |
| 4.824                 | 3.0         | 24.1         | 32.7       | 5.8      | -34.8     | 0.0          | 0.0        | 27.7            | 54.0            | -26.3        | H               | A              |       |
| 4.824                 | 3.0         | 36.0         | 32.7       | 5.8      | -34.8     | 0.0          | 0.0        | 39.6            | 74.0            | -34.4        | V               | P              |       |
| 4.824                 | 3.0         | 24.0         | 32.7       | 5.8      | -34.8     | 0.0          | 0.0        | 27.7            | 54.0            | -26.3        | V               | A              |       |
| <b>2437 MHz, HT20</b> |             |              |            |          |           |              |            |                 |                 |              |                 |                |       |
| 4.874                 | 3.0         | 41.3         | 32.7       | 5.8      | -34.8     | 0.0          | 0.0        | 45.1            | 74.0            | -28.9        | V               | P              |       |
| 4.874                 | 3.0         | 28.6         | 32.7       | 5.8      | -34.8     | 0.0          | 0.0        | 32.3            | 54.0            | -21.7        | V               | A              |       |
| 4.874                 | 3.0         | 50.0         | 32.7       | 5.8      | -34.8     | 0.0          | 0.0        | 53.7            | 74.0            | -20.3        | H               | P              |       |
| 4.874                 | 3.0         | 35.9         | 32.7       | 5.8      | -34.8     | 0.0          | 0.0        | 39.6            | 54.0            | -14.4        | H               | A              |       |
| <b>2462 MHz, HT20</b> |             |              |            |          |           |              |            |                 |                 |              |                 |                |       |
| 4.924                 | 3.0         | 43.9         | 32.7       | 5.9      | -34.8     | 0.0          | 0.0        | 47.7            | 74.0            | -26.3        | H               | P              |       |
| 4.924                 | 3.0         | 29.5         | 32.7       | 5.9      | -34.8     | 0.0          | 0.0        | 33.3            | 54.0            | -20.7        | H               | A              |       |
| 4.924                 | 3.0         | 39.6         | 32.7       | 5.9      | -34.8     | 0.0          | 0.0        | 43.4            | 74.0            | -30.6        | V               | P              |       |
| 4.924                 | 3.0         | 26.4         | 32.7       | 5.9      | -34.8     | 0.0          | 0.0        | 30.2            | 54.0            | -23.8        | V               | A              |       |

Rev. 4.1.2.7

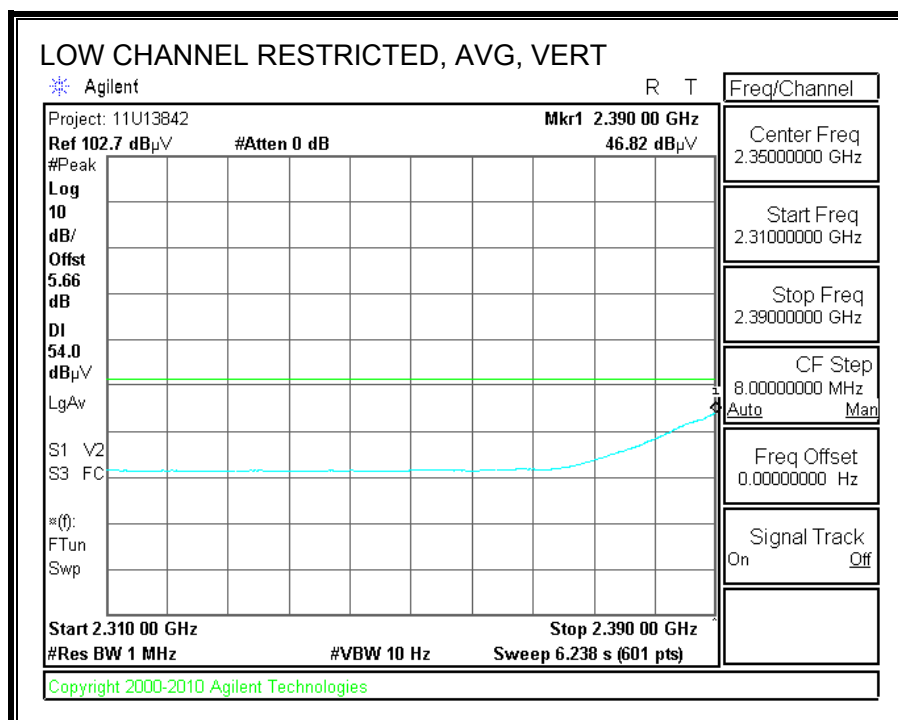
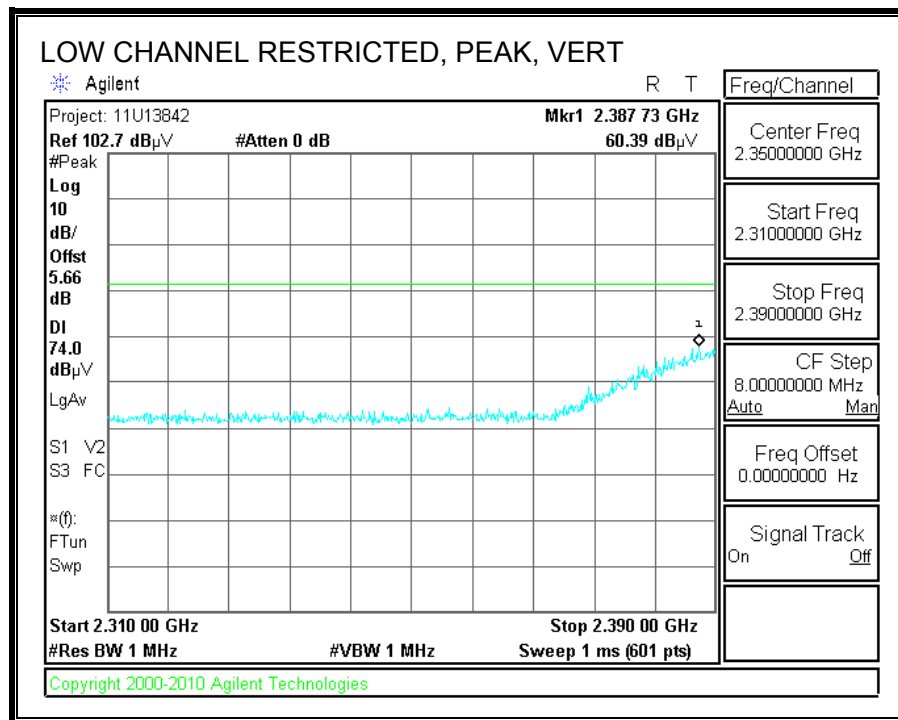
Note: No other emissions were detected above the system noise floor.

### 7.2.1. 2.4 GHz BAND 11n HT40 MODE

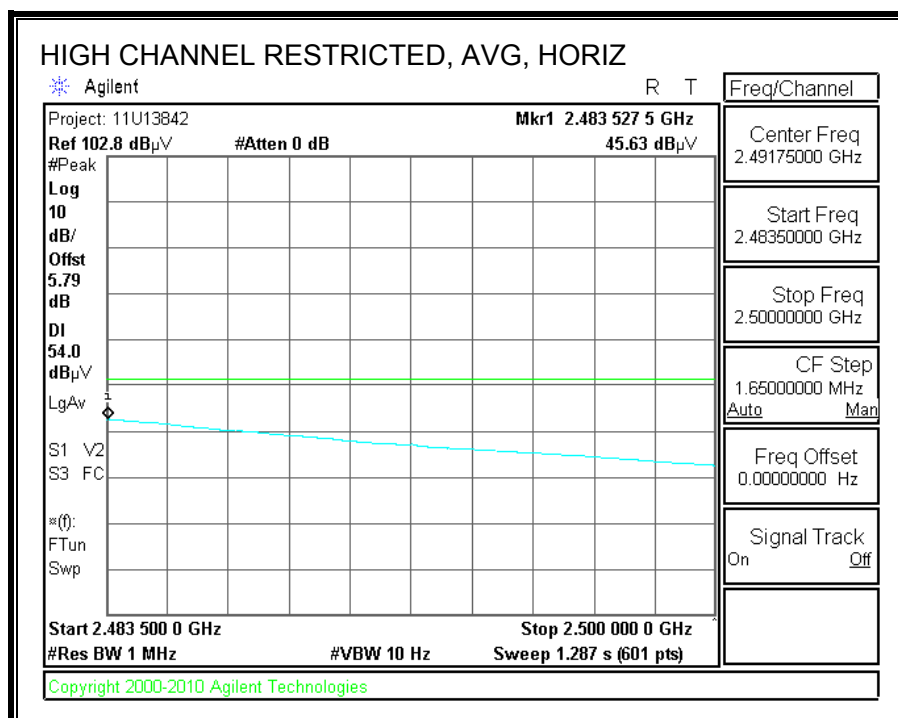
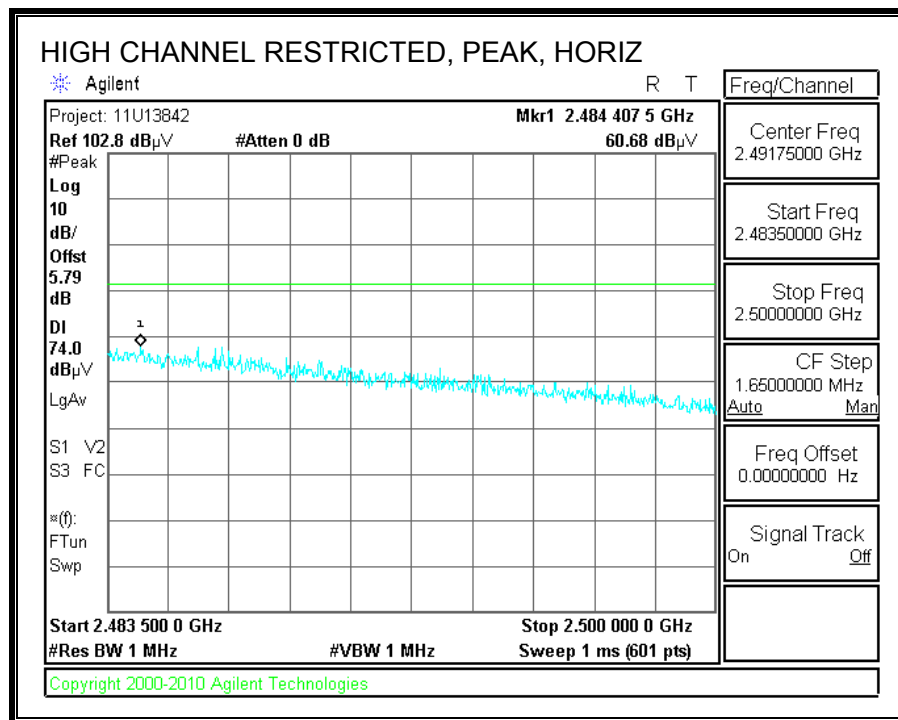
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



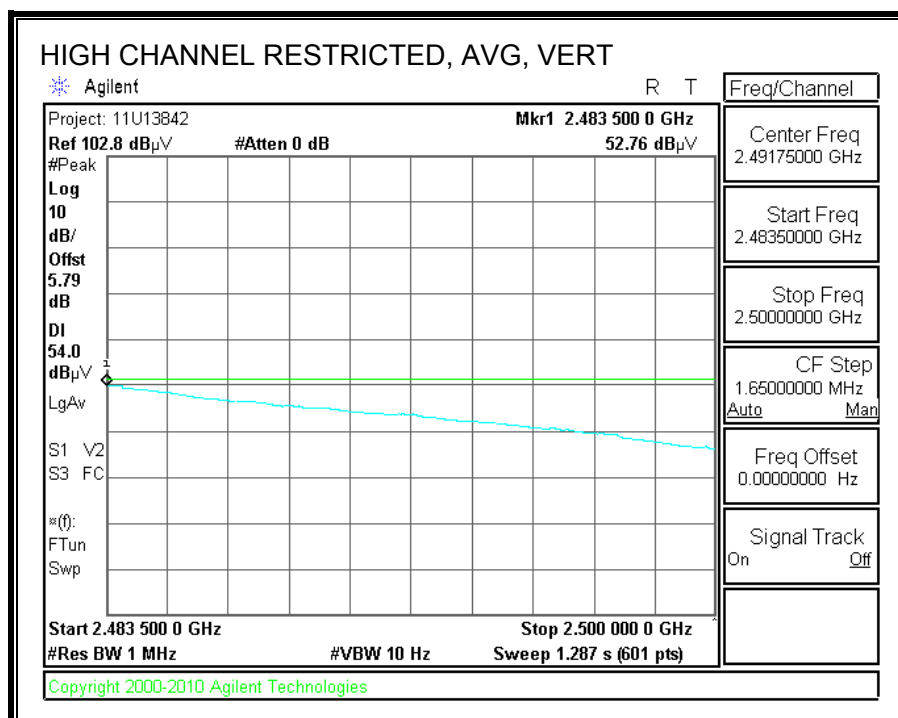
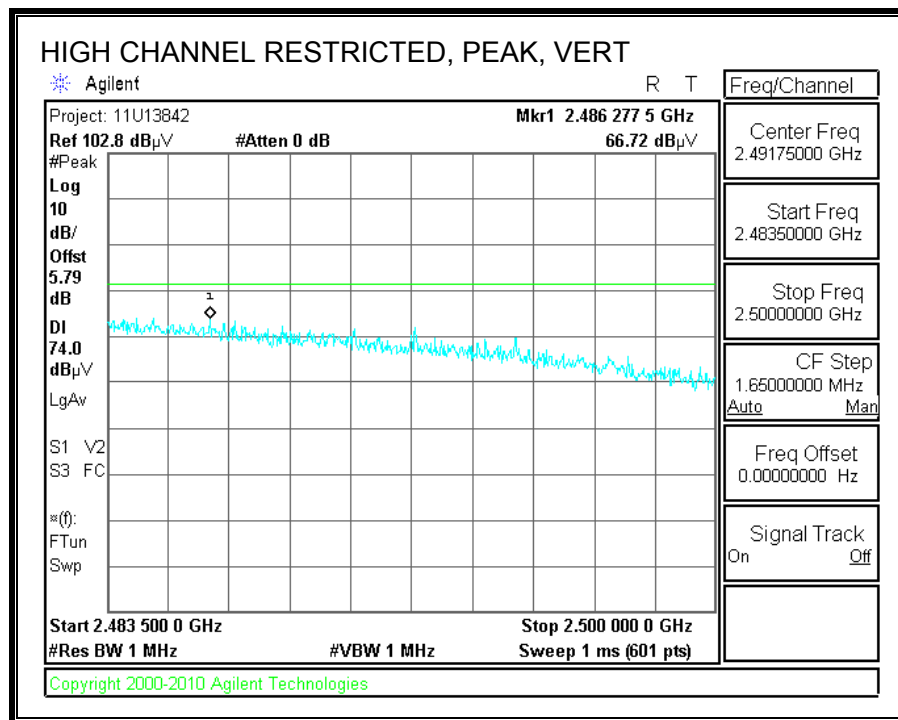
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



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



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

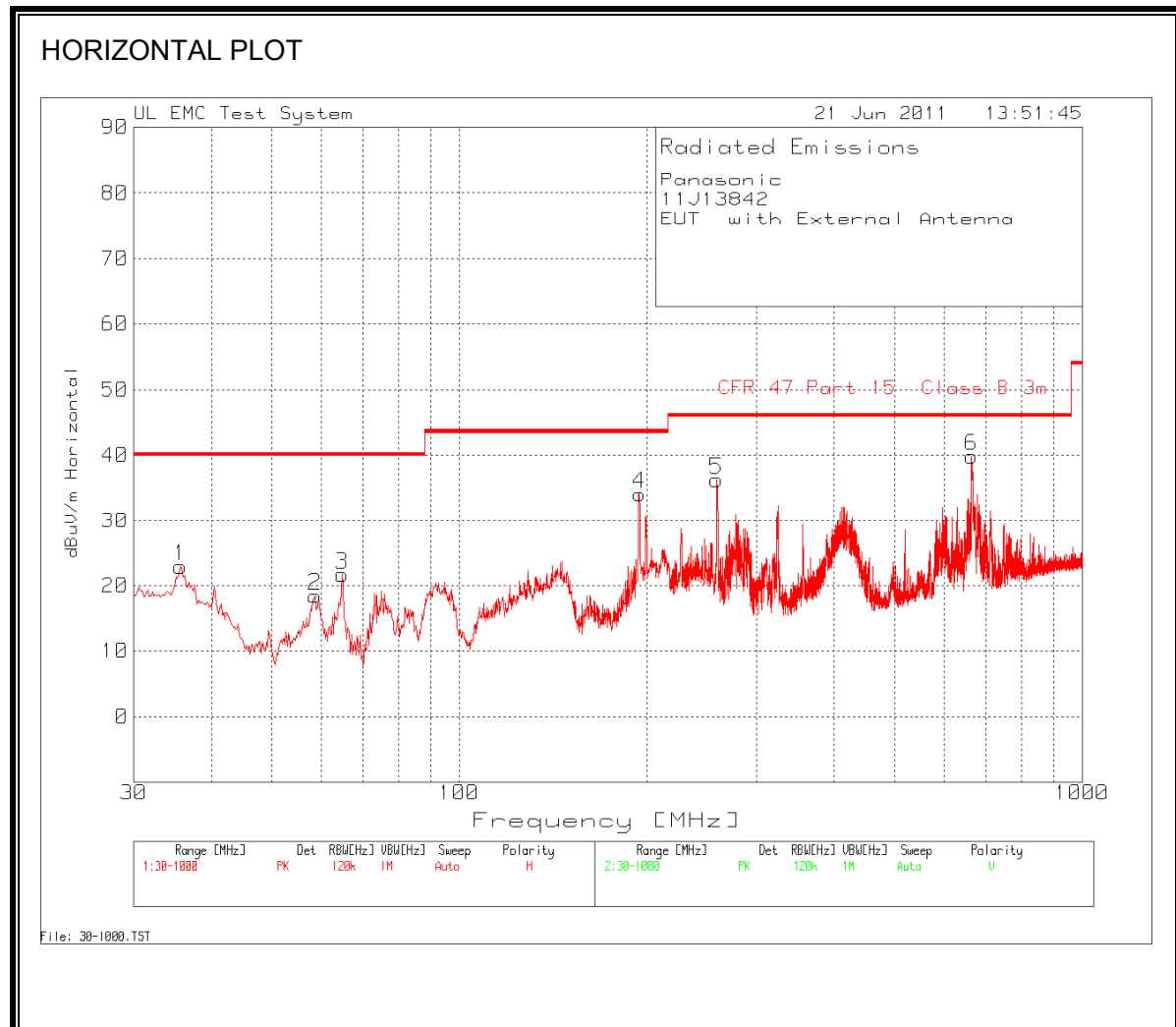


# HARMONICS AND SPURIOUS EMISSIONS

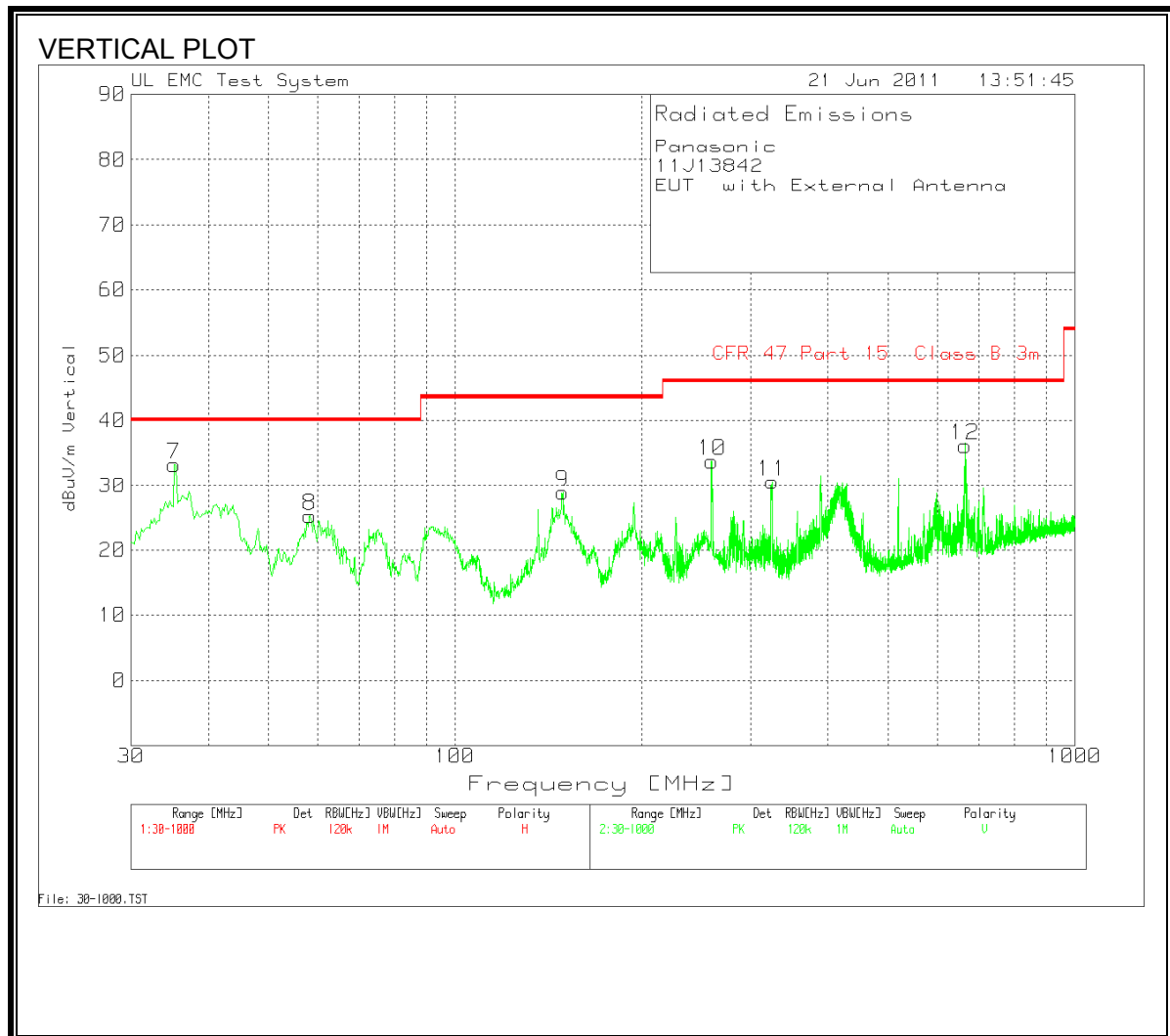
| <b>High Frequency Measurement</b><br><b>Compliance Certification Services, Fremont 5m Chamber</b>                                                                                    |                       |              |                                |                              |           |              |            |                 |                 |              |                  |                |       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------|--------------------------------|------------------------------|-----------|--------------|------------|-----------------|-----------------|--------------|------------------|----------------|-------|
| <b>Test Engr:</b> Tom Chen<br><b>Date:</b> 06/21/11<br><b>Project #:</b> 11J13842<br><b>Company:</b> Panasonic<br><b>Test Target:</b> FCC Class B<br><b>Mode Oper:</b> HT40 ,TX mode |                       |              |                                |                              |           |              |            |                 |                 |              |                  |                |       |
| f                                                                                                                                                                                    | Measurement Frequency | Amp          | Preamp Gain                    | Average Field Strength Limit |           |              |            |                 |                 |              |                  |                |       |
| Dist                                                                                                                                                                                 | Distance to Antenna   | D Corr       | Distance Correct to 3 meters   | Peak Field Strength Limit    |           |              |            |                 |                 |              |                  |                |       |
| Read                                                                                                                                                                                 | Analyzer Reading      | Avg          | Average Field Strength @ 3 m   | Margin vs. Average Limit     |           |              |            |                 |                 |              |                  |                |       |
| AF                                                                                                                                                                                   | Antenna Factor        | Peak         | Calculated Peak Field Strength | Margin vs. Peak Limit        |           |              |            |                 |                 |              |                  |                |       |
| CL                                                                                                                                                                                   | Cable Loss            | HPF          | High Pass Filter               |                              |           |              |            |                 |                 |              |                  |                |       |
| f<br>GHz                                                                                                                                                                             | Dist<br>(m)           | Read<br>dBuV | AF<br>dB/m                     | CL<br>dB                     | Amp<br>dB | D Corr<br>dB | Fitr<br>dB | Corr.<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Ant. Pol.<br>V/H | Det.<br>P/A/QP | Notes |
| <b>2422 MHz, HT40</b>                                                                                                                                                                |                       |              |                                |                              |           |              |            |                 |                 |              |                  |                |       |
| 4.844                                                                                                                                                                                | 3.0                   | 36.5         | 32.7                           | 5.8                          | -34.8     | 0.0          | 0.0        | 40.2            | 74.0            | -33.8        | V                | P              |       |
| 4.844                                                                                                                                                                                | 3.0                   | 24.1         | 32.7                           | 5.8                          | -34.8     | 0.0          | 0.0        | 27.8            | 54.0            | -26.3        | V                | A              |       |
| 4.844                                                                                                                                                                                | 3.0                   | 36.0         | 32.7                           | 5.8                          | -34.8     | 0.0          | 0.0        | 39.7            | 74.0            | -34.3        | H                | P              |       |
| 4.844                                                                                                                                                                                | 3.0                   | 24.1         | 32.7                           | 5.8                          | -34.8     | 0.0          | 0.0        | 27.8            | 54.0            | -26.2        | H                | A              |       |
| <b>2437 MHz, HT40</b>                                                                                                                                                                |                       |              |                                |                              |           |              |            |                 |                 |              |                  |                |       |
| 4.874                                                                                                                                                                                | 3.0                   | 37.5         | 32.7                           | 5.8                          | -34.8     | 0.0          | 0.0        | 41.2            | 74.0            | -32.8        | H                | P              |       |
| 4.874                                                                                                                                                                                | 3.0                   | 25.1         | 32.7                           | 5.8                          | -34.8     | 0.0          | 0.0        | 28.8            | 54.0            | -25.2        | H                | A              |       |
| 4.874                                                                                                                                                                                | 3.0                   | 37.7         | 32.7                           | 5.8                          | -34.8     | 0.0          | 0.0        | 41.4            | 74.0            | -32.6        | V                | P              |       |
| 4.874                                                                                                                                                                                | 3.0                   | 25.1         | 32.7                           | 5.8                          | -34.8     | 0.0          | 0.0        | 28.8            | 54.0            | -25.2        | V                | A              |       |
| <b>2452 MHz, HT40</b>                                                                                                                                                                |                       |              |                                |                              |           |              |            |                 |                 |              |                  |                |       |
| 4.904                                                                                                                                                                                | 3.0                   | 36.9         | 32.7                           | 5.9                          | -34.8     | 0.0          | 0.0        | 40.7            | 74.0            | -33.3        | V                | P              |       |
| 4.904                                                                                                                                                                                | 3.0                   | 24.2         | 32.7                           | 5.9                          | -34.8     | 0.0          | 0.0        | 28.0            | 54.0            | -26.0        | V                | A              |       |
| 4.904                                                                                                                                                                                | 3.0                   | 37.7         | 32.7                           | 5.9                          | -34.8     | 0.0          | 0.0        | 41.5            | 74.0            | -32.5        | H                | P              |       |
| 4.904                                                                                                                                                                                | 3.0                   | 25.0         | 32.7                           | 5.9                          | -34.8     | 0.0          | 0.0        | 28.8            | 54.0            | -25.2        | H                | A              |       |
| Rev. 4.1.2.7                                                                                                                                                                         |                       |              |                                |                              |           |              |            |                 |                 |              |                  |                |       |
| Note: No other emissions were detected above the system noise floor.                                                                                                                 |                       |              |                                |                              |           |              |            |                 |                 |              |                  |                |       |

### 7.3. 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)**



# HORIZONTAL AND VERTICAL DATA

|                         |                           |          |            |           |        |           |      |        |    |
|-------------------------|---------------------------|----------|------------|-----------|--------|-----------|------|--------|----|
|                         | Panasonic                 |          |            |           |        |           |      |        |    |
|                         | 11J13842                  |          |            |           |        |           |      |        |    |
|                         | EUT with External Antenna |          |            |           |        |           |      |        |    |
| Horizontal 30 -1000 MHz |                           |          |            |           |        |           |      |        |    |
|                         | Test                      | Meter    | Transducer | Gain/Loss | Level  | Limit:FCC |      | Margin |    |
| No.                     | Frequency                 | Reading  | Factor     | Factor    | dBuV/m |           |      | [dB]   |    |
|                         | [MHz]                     | [dB(uV)] | [dB]       | [dB]      |        |           |      |        |    |
| 1                       | 35.62                     | 33.49    | 0.70       | -11.30    | 22.89  | 40.00     | Horz | -17.11 | PK |
| 2                       | 58.69                     | 37.73    | 0.80       | -20.10    | 18.43  | 40.00     | Horz | -21.57 | PK |
| 3                       | 64.89                     | 40.86    | 0.90       | -20.10    | 21.66  | 40.00     | Horz | -18.34 | PK |
| 4                       | 194.77                    | 48.80    | 1.40       | -16.10    | 34.10  | 43.50     | Horz | -9.40  | PK |
| 5                       | 258.93                    | 49.94    | 1.60       | -15.30    | 36.24  | 46.00     | Horz | -9.76  | PK |
| 6                       | 664.26                    | 46.75    | 2.70       | -9.60     | 39.85  | 46.00     | Horz | -6.15  | PK |
| Vertical 30- 1000 MHz   |                           |          |            |           |        |           |      |        |    |
|                         | Test                      | Meter    | Transducer | Gain/Loss | Level  | Limit:FCC |      | Margin |    |
| No.                     | Frequency                 | Reading  | Factor     | Factor    | dBuV/m |           |      | [dB]   |    |
|                         | [MHz]                     | [dB(uV)] | [dB]       | [dB]      |        |           |      |        |    |
| 7                       | 35.23                     | 43.52    | 0.60       | -10.90    | 33.22  | 40.00     | Vert | -6.78  | PK |
| 8                       | 58.30                     | 44.52    | 0.80       | -20.10    | 25.22  | 40.00     | Vert | -14.78 | PK |
| 9                       | 149.21                    | 42.90    | 1.20       | -15.20    | 28.90  | 43.50     | Vert | -14.60 | PK |
| 10                      | 259.90                    | 47.44    | 1.60       | -15.30    | 33.74  | 46.00     | Vert | -12.26 | PK |
| 11                      | 324.84                    | 42.16    | 1.90       | -13.50    | 30.56  | 46.00     | Vert | -15.44 | PK |
| 12                      | 665.81                    | 43.05    | 2.70       | -9.60     | 36.15  | 46.00     | Vert | -9.85  | PK |

Note: No other emissions were detected above noise floor

## 7.4. AC MAINS LINE CONDUCTED EMISSIONS

### TEST PROCEDURE

ANSI C63.4

### LIMIT

§15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

| Frequency range<br>(MHz) | Limits (dB $\mu$ V) |          |
|--------------------------|---------------------|----------|
|                          | Quasi-peak          | Average  |
| 0.15 to 0.50             | 66 to 56            | 56 to 46 |
| 0.50 to 5                | 56                  | 46       |
| 5 to 30                  | 60                  | 50       |

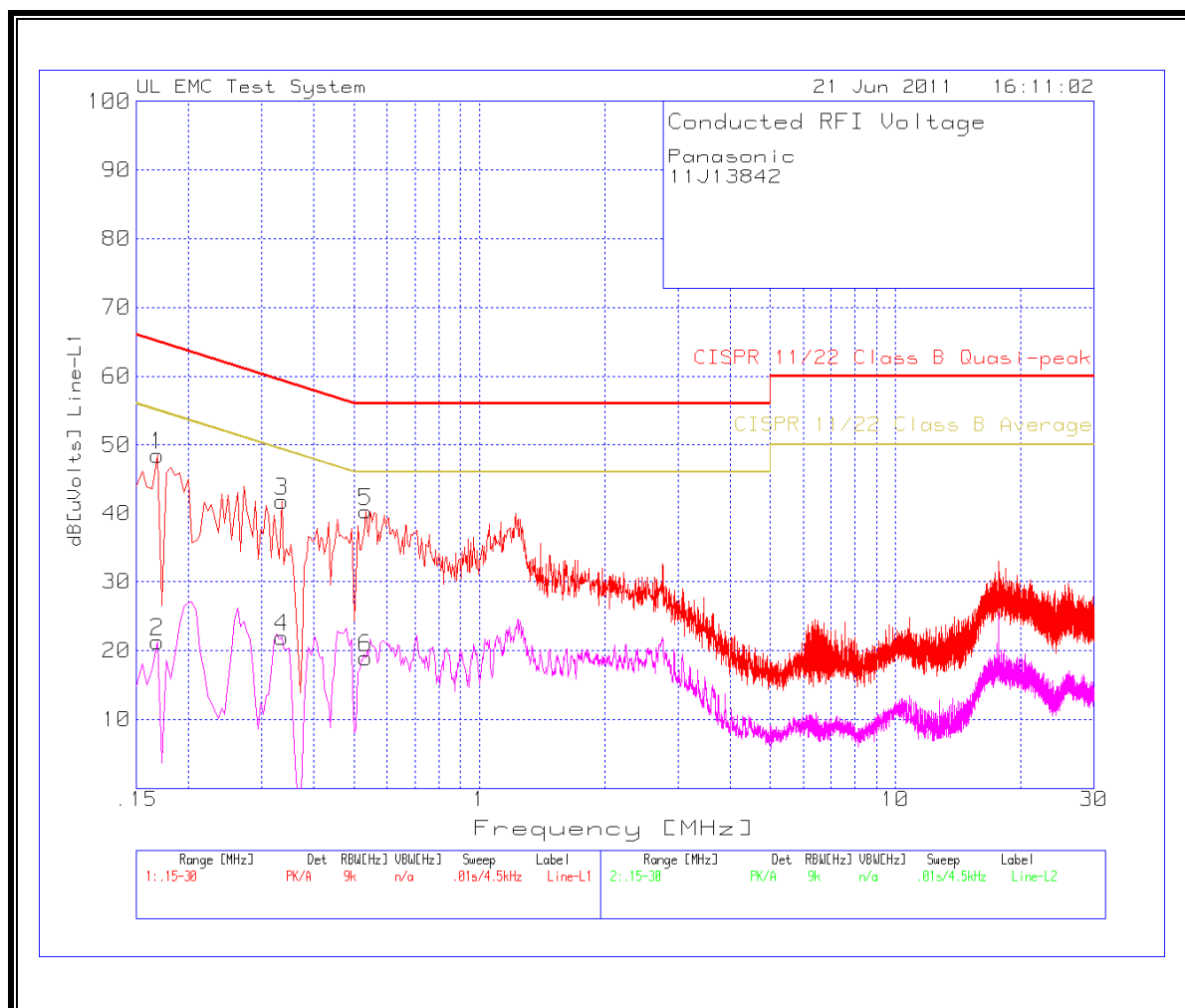
Notes:  
1. The lower limit shall apply at the transition frequencies  
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

## RESULTS

### 6 WORST EMISSIONS

| Panasonic           |               |          |            |                                |        |                             |        |  |
|---------------------|---------------|----------|------------|--------------------------------|--------|-----------------------------|--------|--|
| 11J13842            |               |          |            |                                |        |                             |        |  |
| Line-L1 .15 - 30MHz |               |          |            |                                |        |                             |        |  |
| Test Frequency      | Meter Reading | Detector | dB[uVolts] | CISPR 11/22 Class B Quasi-peak | Margin | CISPR 11/22 Class B Average | Margin |  |
| 0.17                | 48.45         | PK       | 48.45      | 65.10                          | -16.65 | 55.10                       | -6.65  |  |
| 0.17                | 21.31         | Av       | 21.31      | -                              | -      | 55.10                       | -33.79 |  |
| 0.33                | 41.82         | PK       | 41.82      | 59.30                          | -17.48 | 49.30                       | -7.48  |  |
| 0.33                | 21.86         | Av       | 21.86      | -                              | -      | 49.30                       | -27.44 |  |
| 0.53                | 40.23         | PK       | 40.23      | 56.00                          | -15.77 | 46.00                       | -6.37  |  |
| 0.53                | 18.90         | Av       | 18.90      | -                              | -      | 46.00                       | -27.10 |  |
| Line-L2 .15 - 30MHz |               |          |            |                                |        |                             |        |  |
| Test Frequency      | Meter Reading | Detector | dB[uVolts] | CISPR 11/22 Class B Quasi-peak | Margin | CISPR 11/22 Class B Average | Margin |  |
| 0.17                | 47.21         | PK       | 47.21      | 65.10                          | -17.89 | 55.10                       | -7.89  |  |
| 0.17                | 18.35         | Av       | 18.35      | -                              | -      | 55.10                       | -36.75 |  |
| 0.34                | 31.45         | PK       | 31.45      | 59.10                          | -27.65 | 49.10                       | -17.65 |  |
| 0.34                | 17.82         | Av       | 17.82      | -                              | -      | 49.10                       | -31.28 |  |
| 0.58                | 32.56         | PK       | 32.56      | 56.00                          | -23.44 | 46.00                       | -13.44 |  |
| 0.58                | 15.29         | Av       | 15.29      | -                              | -      | 46.00                       | -30.71 |  |

# **LINE 1 RESULTS**



**LINE 2 RESULTS**

