



**FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8**

**CLASS II PERMISSIVE CHANGE
TEST REPORT**

FOR

802.11n 2x2 PCIe MINICARD, add Panasonic Tablet PC CF-H2

MODEL NUMBER: WL11E

FCC ID: ACJ9TGWL11E

REPORT NUMBER: 11J13970-11

ISSUE DATE: AUGUST 15, 2011

Prepared for

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

Prepared by

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NVLAP LAB CODE 200065-0

Revision History

| <u>Rev.</u> | <u>Issue Date</u> | <u>Revisions</u> | <u>Revised By</u> |
|-------------|-------------------|------------------|-------------------|
| -- | 08/15/11 | Initial Issue | F. Ibrahim |

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: 802.11n 2x2 PCIe MINICARD, add Panasonic Tablet PC CF-H2

MODEL: WL11E

SERIAL NUMBER: 1FKSA00538

DATE TESTED: AUGUST 03-04, 2011

| APPLICABLE STANDARDS | |
|---|--------------|
| STANDARD | TEST RESULTS |
| CFR 47 Part 15 Subpart C | Pass |
| INDUSTRY CANADA RSS-210 Issue 8 Annex 8 | Pass |
| INDUSTRY CANADA RSS-GEN Issue 3 | 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:



Tadaomi Yamano
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, FCC CFR 47 Part 15, 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 802.11b/g/n that operates in the 2.4GHz band.

The radio module is manufactured by Atheros Communications.

5.2. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The major change filed under this application is adding Portable Panasonic Host (Representative model; CF-H2).

5.3. MAXIMUM OUTPUT POWER

The measured output power is within ± 0.5 dBm of the original output power.

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna, Main and Aux antenna with a maximum gain as:

| | | |
|-----------------|-------------|------------|
| WL11E | | |
| Original | Main | Aux |
| | -0.07 | 0.53 |
| CF-H2 | | |
| | 0.7 | 1.54 |

5.5. SOFTWARE AND FIRMWARE

The test utility software used during testing was ART Revision 0.9 Built #34 Art_11n

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:

For 11b mode: 1Mbps
For 11g mode: 6Mbps
For 11n HT20 (2.4 GHz band): MCS0
For 11n HT40 (2.4 GHz band): MCS0

The EUT was investigated in three orthogonal orientations X,Y,Z and it was determined that Y-axis orientation is the worst-case orientation; therefore, all testing in this report was conducted with EUT in worst case orientation.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

| PERIPHERAL SUPPORT EQUIPMENT LIST | | | | |
|-----------------------------------|--------------|------------|------------------|--------|
| Description | Manufacturer | Model | Serial Number | FCC ID |
| TABLET PC | PANASONIC | CF-H2 | 1FKSA00538 | DoC |
| AC Adapter | PANASONIC | CF-AA6373A | 6373AM111203009A | DoC |

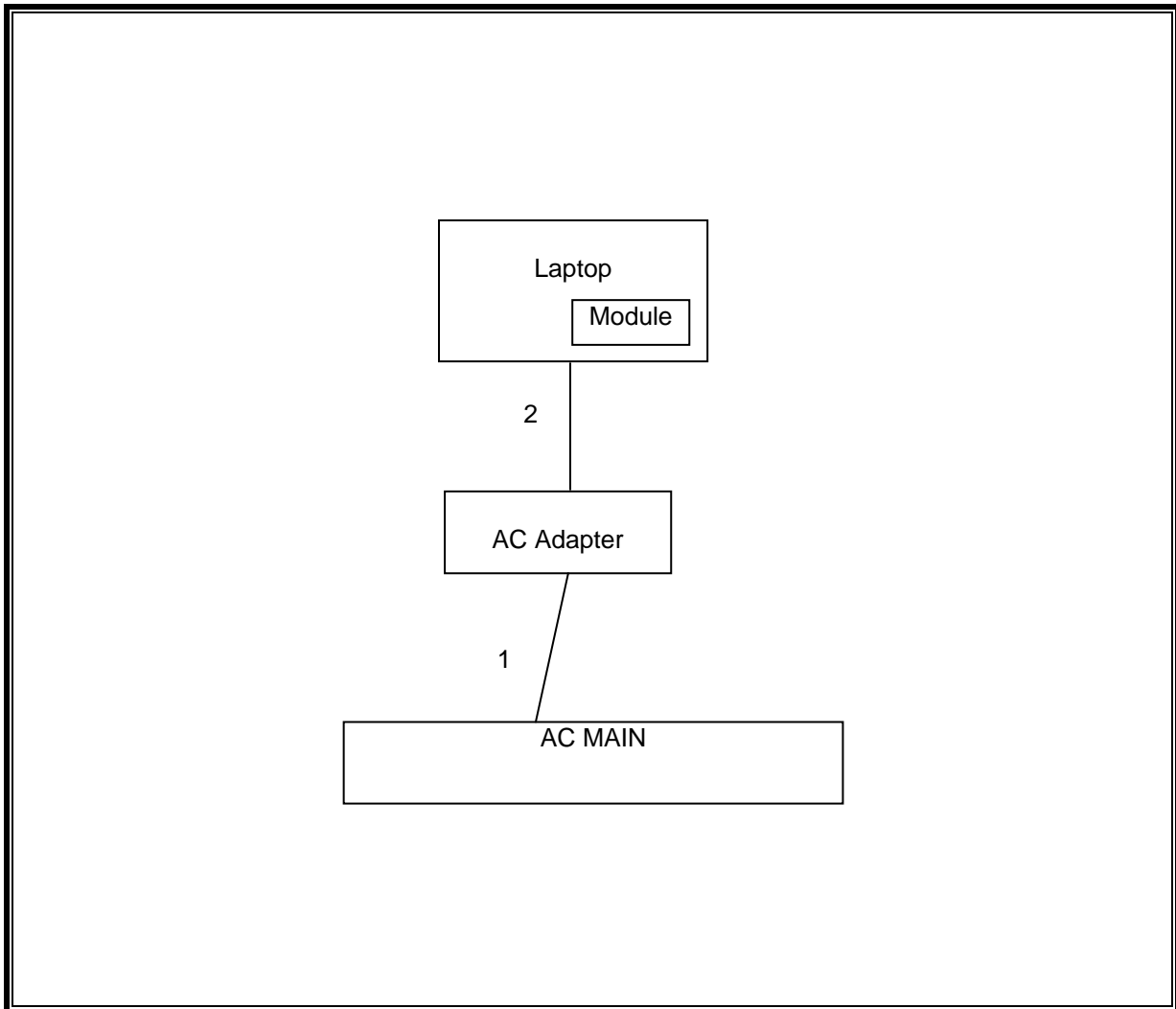
I/O CABLES

| 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 | 100 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 |
| Preamplifier, 26.5 GHz | Agilent / HP | 8449B | C00749 | 07/18/11 | 07/18/12 |
| Antenna, Horn, 18 GHz | EMCO | 3115 | C00872 | 06/29/11 | 06/29/12 |
| Antenna, Horn, 26.5 GHz | ARA | SWH-28 | C01015 | 07/28/11 | 07/28/12 |
| Antenna, Bilog, 2 GHz | Sunol Sciences | JB1 | C01171 | 07/16/11 | 07/16/12 |
| Preamplifier, 1300 MHz | Agilent / HP | 8447D | C00558 | 01/27/11 | 01/27/12 |
| EMI Test Receiver, 9 kHz-7 GHz | R & S | ESCI 7 | 1000741 | 07/06/11 | 07/06/12 |
| LISN, 30 MHz | FCC | LISN-50/250-25-2 | N02625 | 11/10/10 | 11/10/11 |
| Peak / Average Power Sensor | Agilent / HP | E9327A | C00964 | 01/07/10 | 04/11/12 |
| Peak Power Meter | Agilent / HP | E4416A | C00963 | 12/04/09 | 04/11/12 |
| Reject Filter, 2.4-2.5 GHz | Micro-Tronics | BRC13192 | N02683 | CNR | CNR |

7. RADIATED TEST RESULTS

7.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. 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.

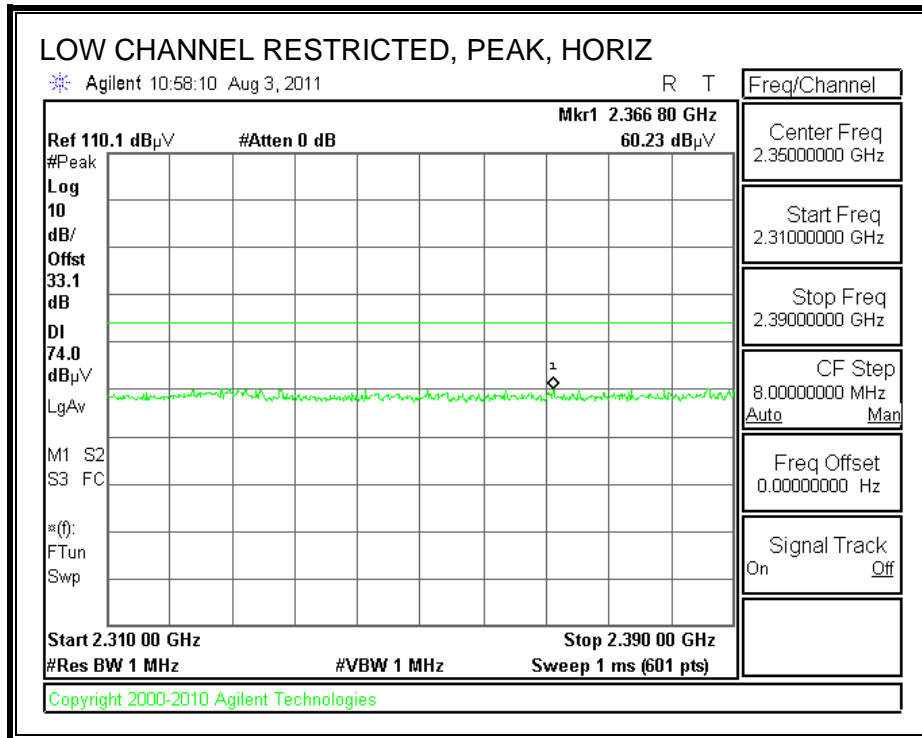
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

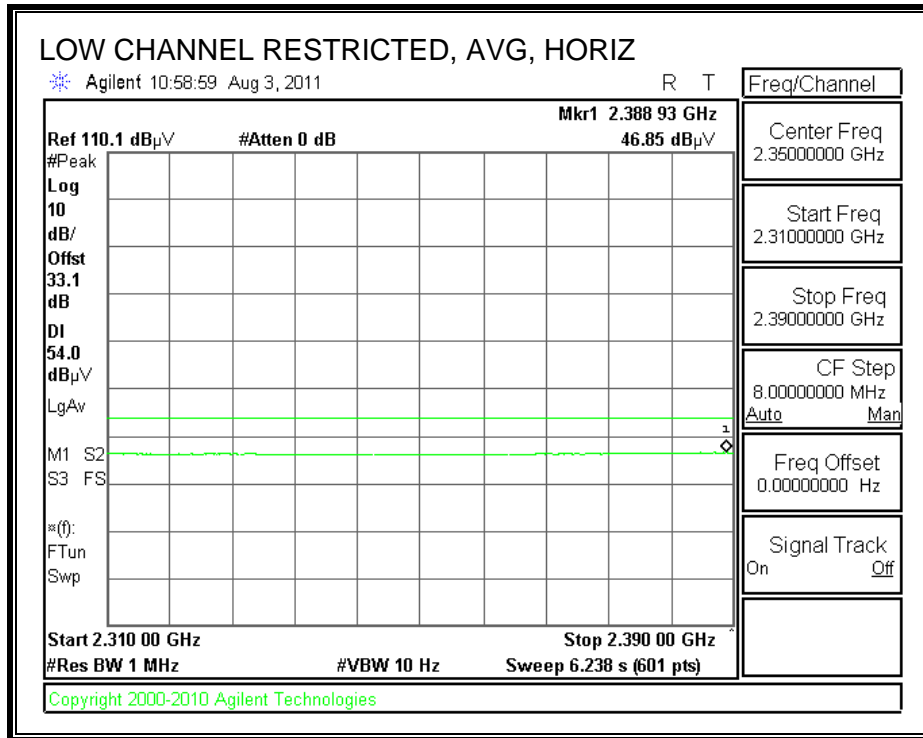
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

7.2. TRANSMITTER ABOVE 1 GHz

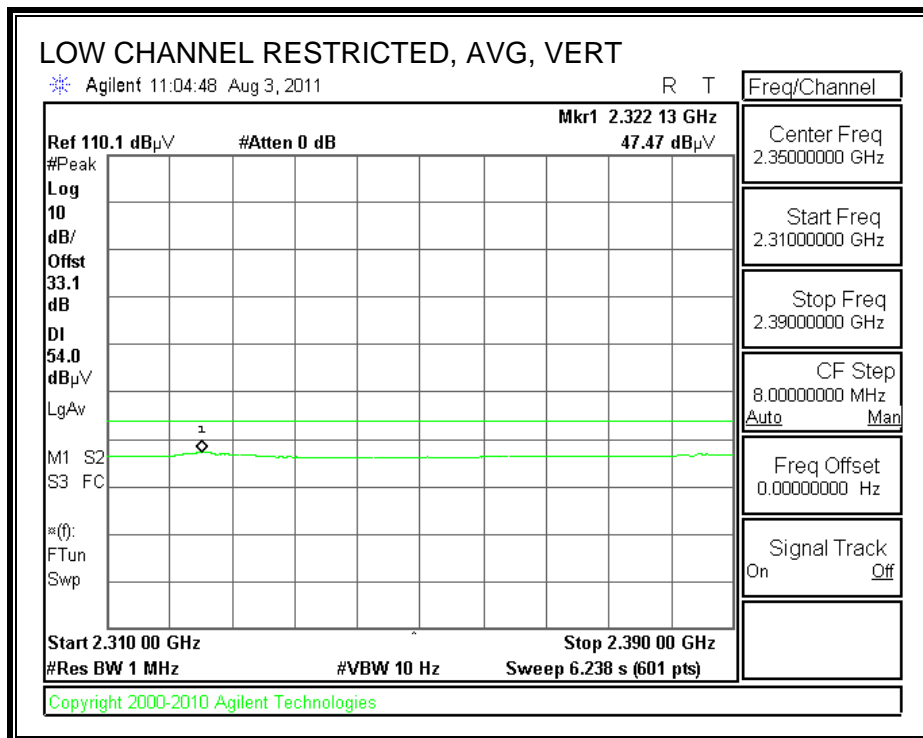
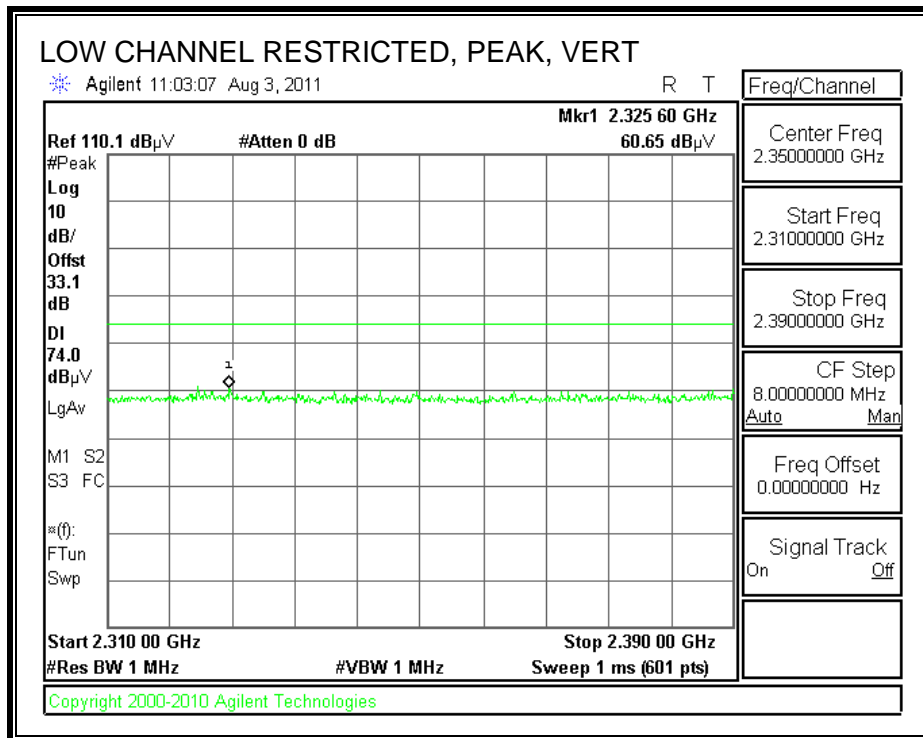
7.2.1. TX ABOVE 1 GHz FOR 802.11b MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

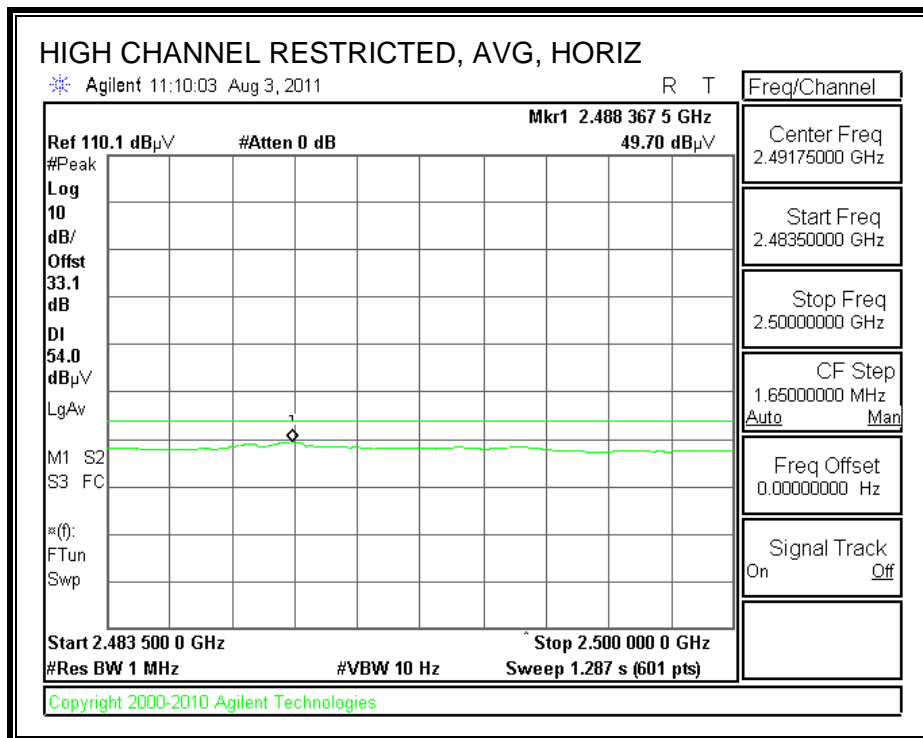
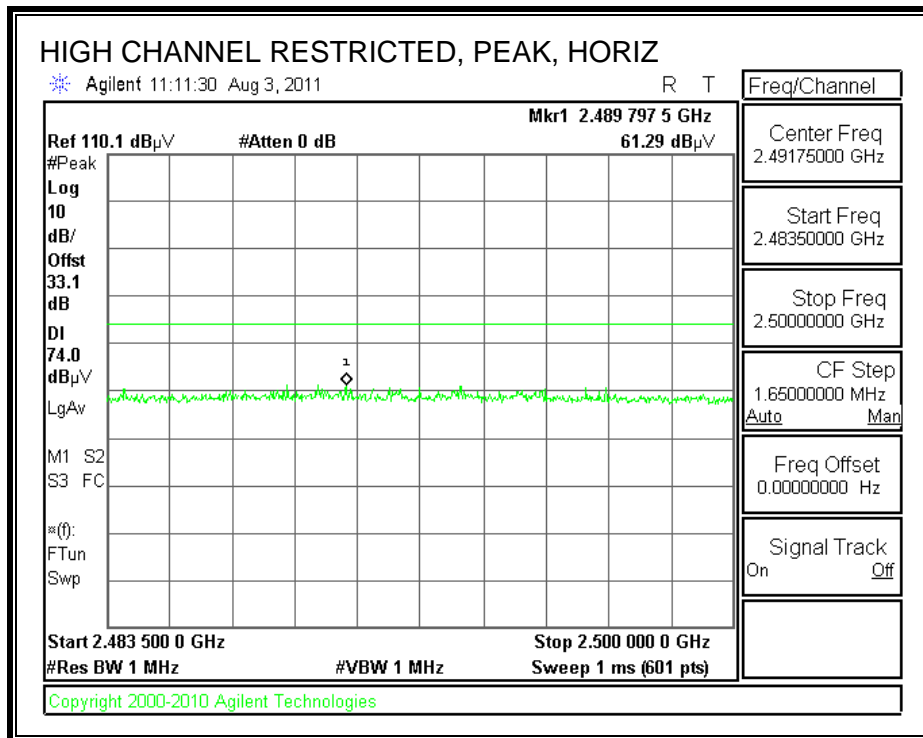




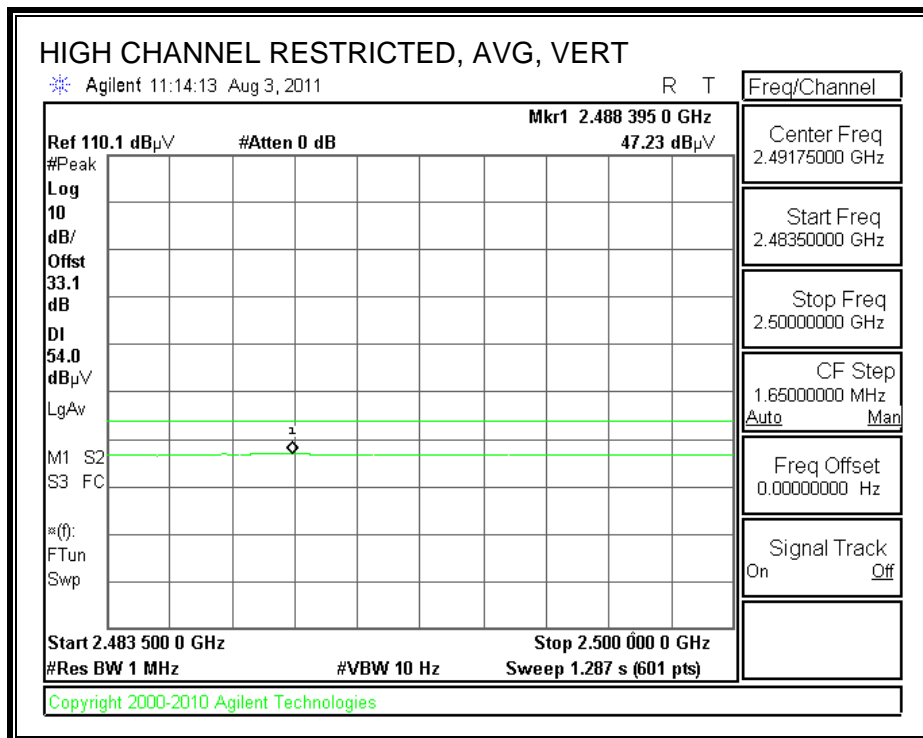
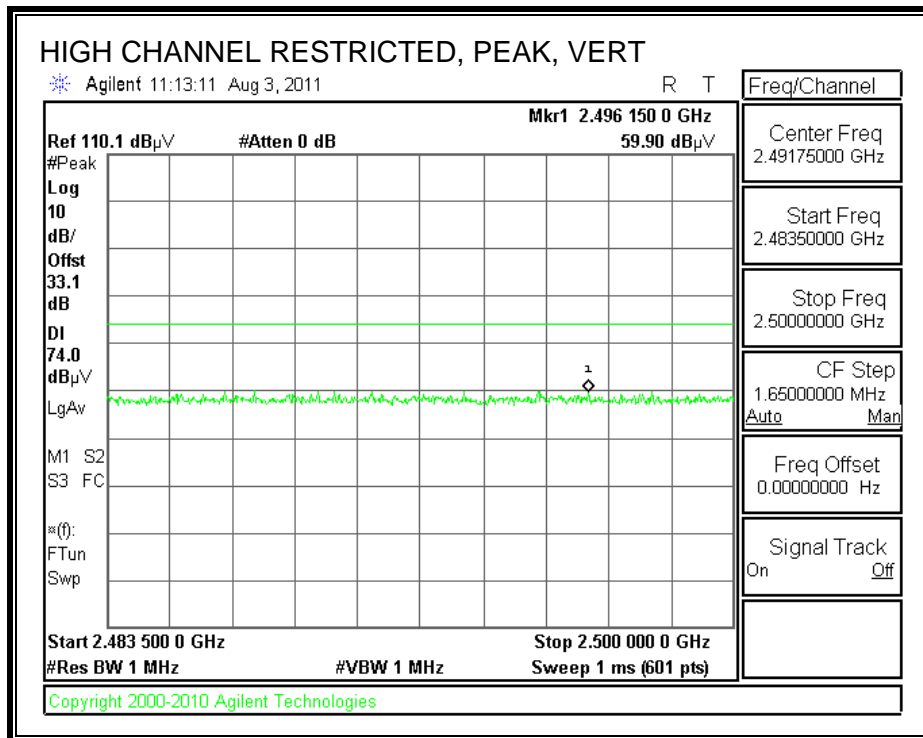
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

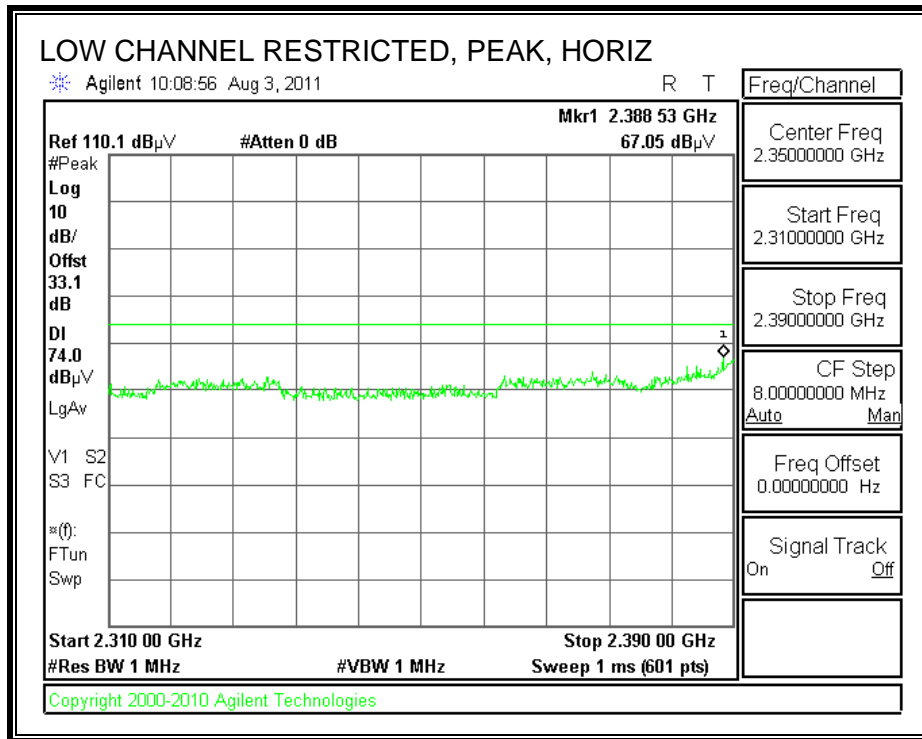


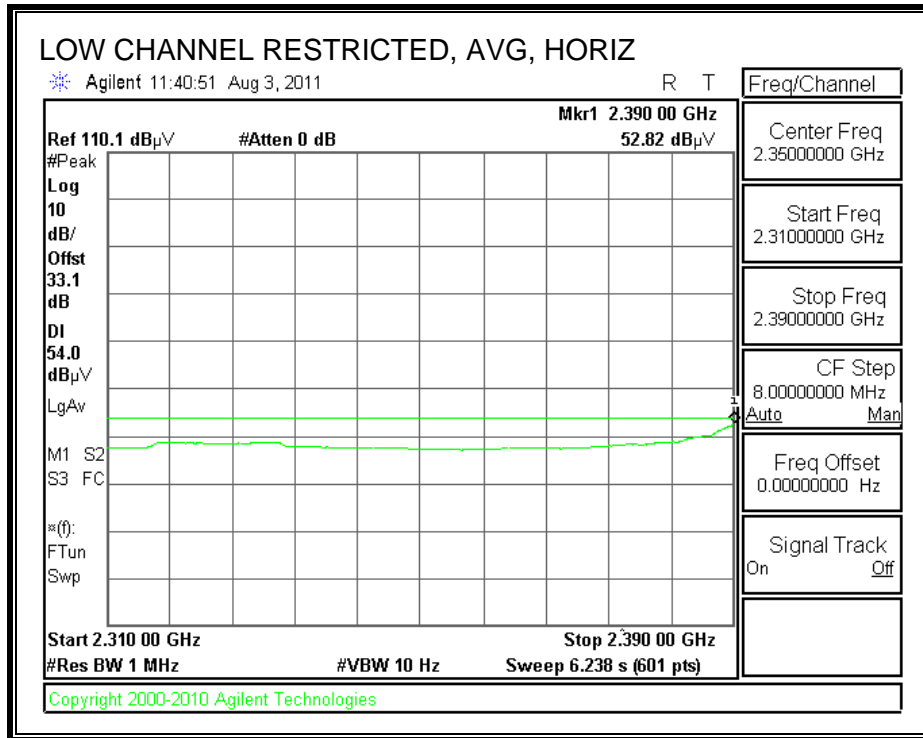
HARMONICS AND SPURIOUS EMISSIONS

| High Frequency Measurement | | | | | | | | | | | | | | | | | |
|---|-----------------------|-----------------|-----------------------|------------|----------|------------------------|--------------------------------|-------------|------------------------------|---------------|------------------|-------------------|---|---------------|----------------|--|--|
| Compliance Certification Services, Fremont 3m Chamber | | | | | | | | | | | | | | | | | |
| Company: | | Panasonic | | | | | | | | | | | | | | | |
| Project #: | | 11J13970 | | | | | | | | | | | | | | | |
| Date: | | 8/4/2011 | | | | | | | | | | | | | | | |
| Test Engineer: | | Tadaomi Yamano | | | | | | | | | | | | | | | |
| Test Target: | | FCC 15.247 | | | | | | | | | | | | | | | |
| Mode: | | Tx On, b Mode | | | | | | | | | | | | | | | |
| Test Equipment: | | | | | | | | | | | | | | | | | |
| Horn 1-18GHz | | | Pre-amplifier 1-26GHz | | | Pre-amplifier 26-40GHz | | | Horn > 18GHz | | | Limit | | | | | |
| T60; S/N: 2238 @3m | | | T34 HP 8449B | | | | | | T125; ARA 18-26GHz; S/N:1007 | | | FCC 15.205 | | | | | |
| Hi Frequency Cables | | | | | | | | | | | | | | | | | |
| 3' cable 22807700 | | | 12' cable 22807600 | | | 20' cable 22807500 | | | HPF | | Reject Filter | | Peak Measurements RBW=VBW=1MHz | | | | |
| 3' cable 22807700 | | | 12' cable 22807600 | | | 20' cable 22807500 | | | | | | | Average Measurements RBW=1MHz ; VBW=10Hz | | | | |
| f GHz | Dist (m) | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Filtr dB | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes (V/H) | | |
| Low Ch. 2412MHz | | | | | | | | | | | | | | | | | |
| 4.824 | 3.0 | 41.3 | 35.1 | 33.9 | 6.8 | -34.1 | 0.0 | 0.0 | 47.9 | 41.7 | 74 | 54 | -26.1 | -12.3 | H | | |
| 4.983 | 3.0 | 51.1 | 32.3 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 58.0 | 39.2 | 74 | 54 | -16.0 | -14.8 | H | | |
| 4.824 | 3.0 | 38.3 | 30.9 | 33.9 | 6.8 | -34.1 | 0.0 | 0.0 | 44.9 | 37.5 | 74 | 54 | -29.1 | -16.5 | V | | |
| 4.983 | 3.0 | 52.6 | 33.4 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 59.6 | 40.3 | 74 | 54 | -14.4 | -13.7 | V | | |
| Mid Ch. 2437MHz | | | | | | | | | | | | | | | | | |
| 4.874 | 3.0 | 47.4 | 45.7 | 33.9 | 6.8 | -34.0 | 0.0 | 0.0 | 54.1 | 52.4 | 74 | 54 | -19.9 | -1.6 | H | | |
| 4.983 | 3.0 | 52.1 | 32.5 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 59.0 | 39.4 | 74 | 54 | -15.0 | -14.6 | H | | |
| 4.874 | 3.0 | 47.2 | 44.6 | 33.9 | 6.8 | -34.0 | 0.0 | 0.0 | 53.9 | 51.3 | 74 | 54 | -20.1 | -2.7 | V | | |
| 4.983 | 3.0 | 52.4 | 30.6 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 59.3 | 37.6 | 74 | 54 | -14.7 | -16.4 | V | | |
| High Ch. 2462MHz | | | | | | | | | | | | | | | | | |
| 4.924 | 3.0 | 47.2 | 44.2 | 34.0 | 6.8 | -34.0 | 0.0 | 0.0 | 54.0 | 51.0 | 74 | 54 | -20.0 | -3.0 | H | | |
| 4.983 | 3.0 | 50.8 | 33.1 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 57.7 | 40.0 | 74 | 54 | -16.3 | -14.0 | H | | |
| 4.924 | 3.0 | 49.0 | 45.2 | 34.0 | 6.8 | -34.0 | 0.0 | 0.0 | 55.8 | 52.0 | 74 | 54 | -18.2 | -2.0 | V | | |
| 4.983 | 3.0 | 51.9 | 32.8 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 58.8 | 39.7 | 74 | 54 | -15.2 | -14.3 | V | | |
| Rev. 07.08.11 | | | | | | | | | | | | | | | | | |
| f | Measurement Frequency | | | | | Amp | Preamp Gain | | | | | Avg Lim | Average Field Strength Limit | | | | |
| Dist | Distance to Antenna | | | | | D Corr | Distance Correct to 3 meters | | | | | Pk Lim | Peak Field Strength Limit | | | | |
| Read | Analyzer Reading | | | | | Avg | Average Field Strength @ 3 m | | | | | Avg Mar | Margin vs. Average Limit | | | | |
| AF | Antenna Factor | | | | | Peak | Calculated Peak Field Strength | | | | | Pk Mar | Margin vs. Peak Limit | | | | |
| CL | Cable Loss | | | | | HPF | High Pass Filter | | | | | | | | | | |

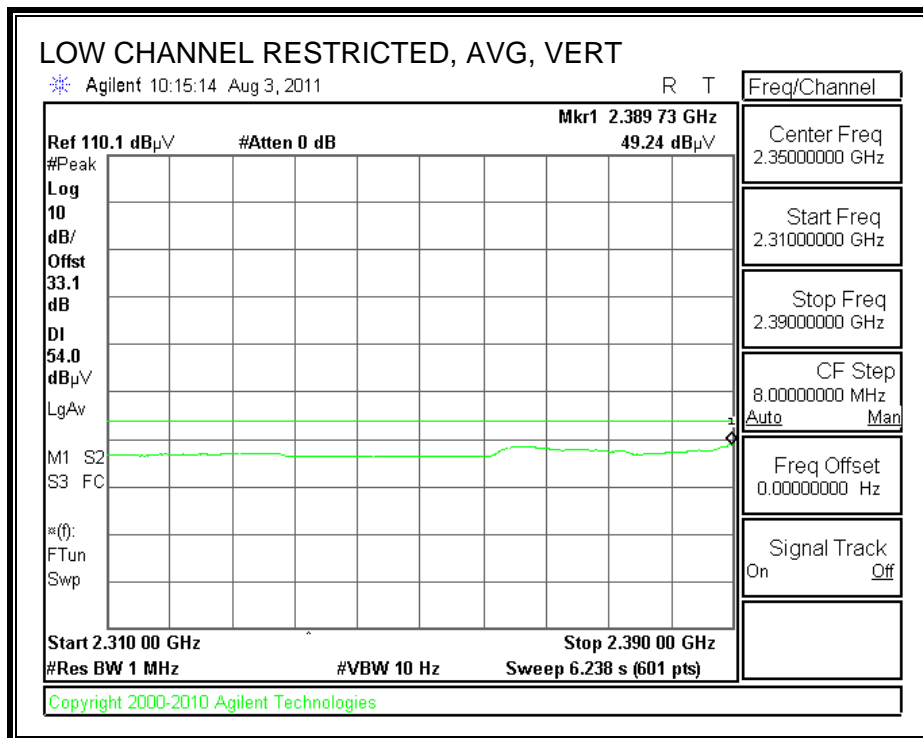
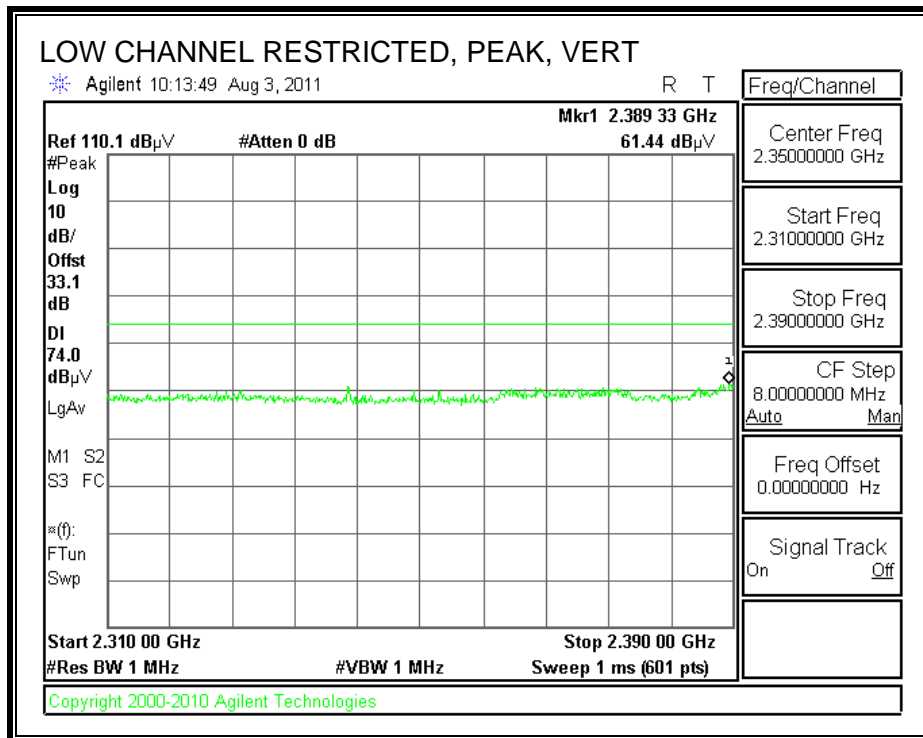
7.2.2. TX ABOVE 1 GHz FOR 802.11g MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

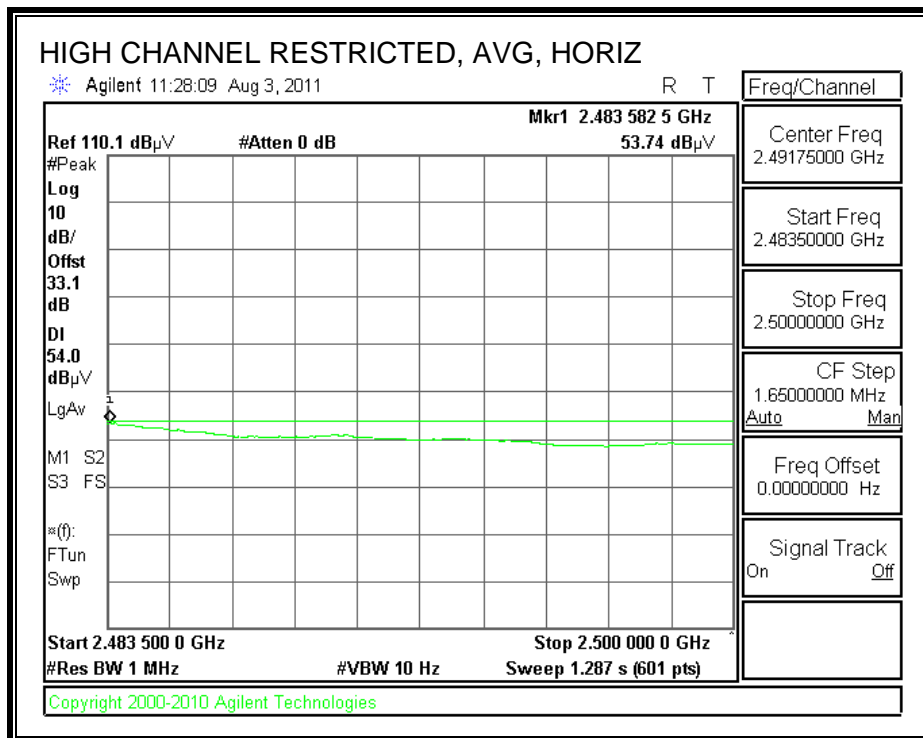
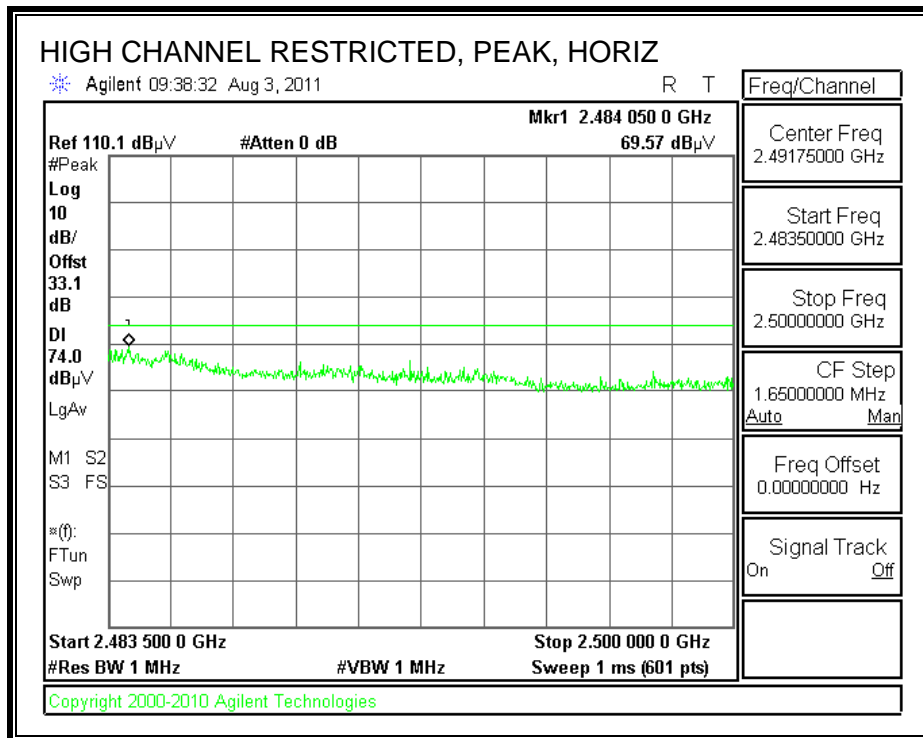




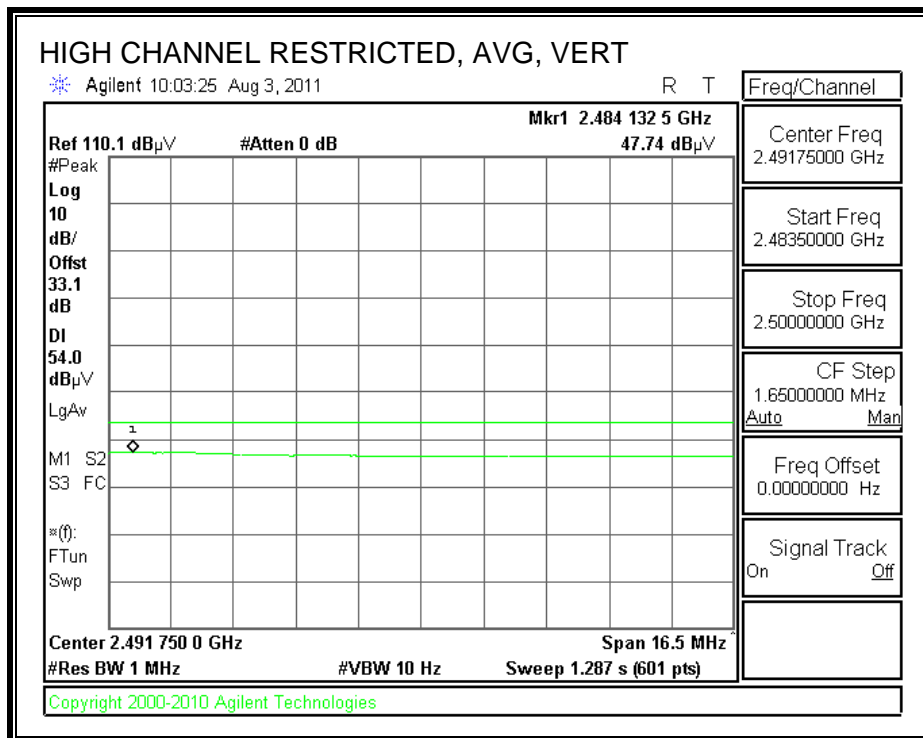
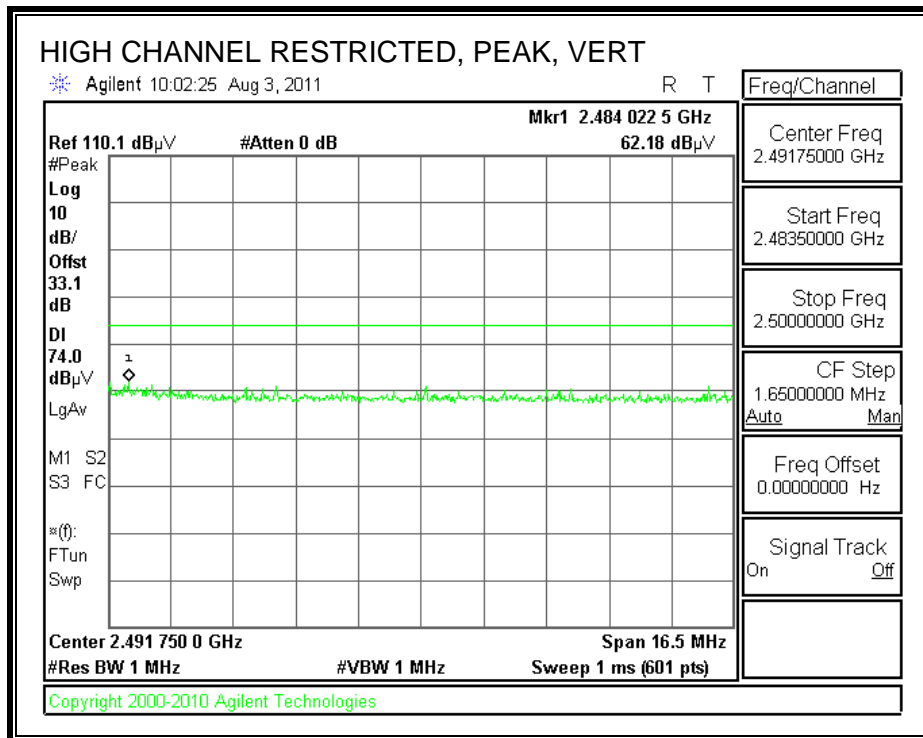
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

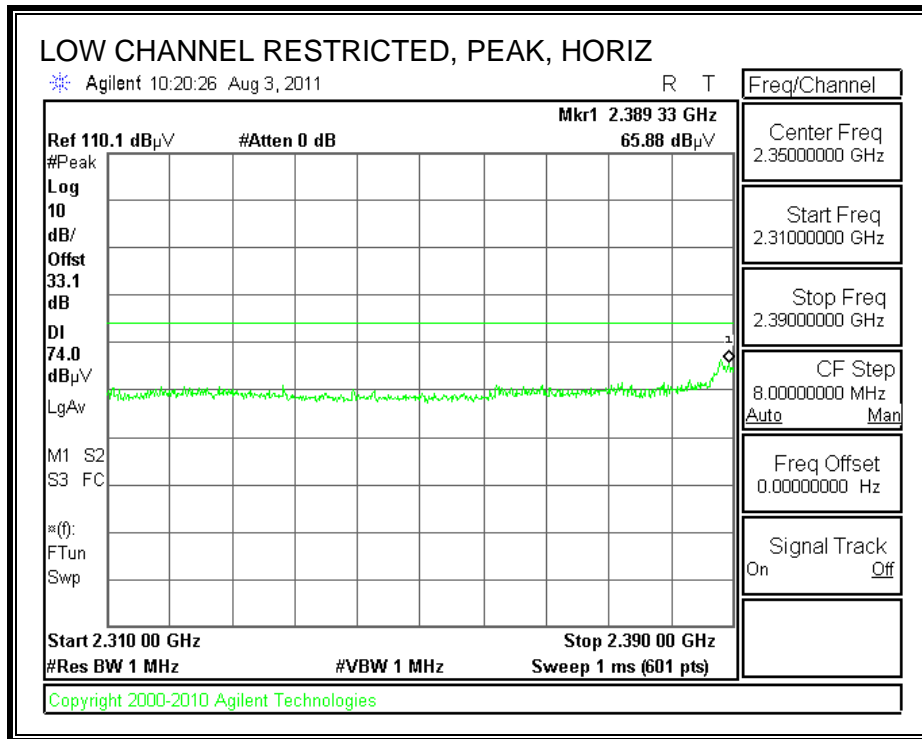


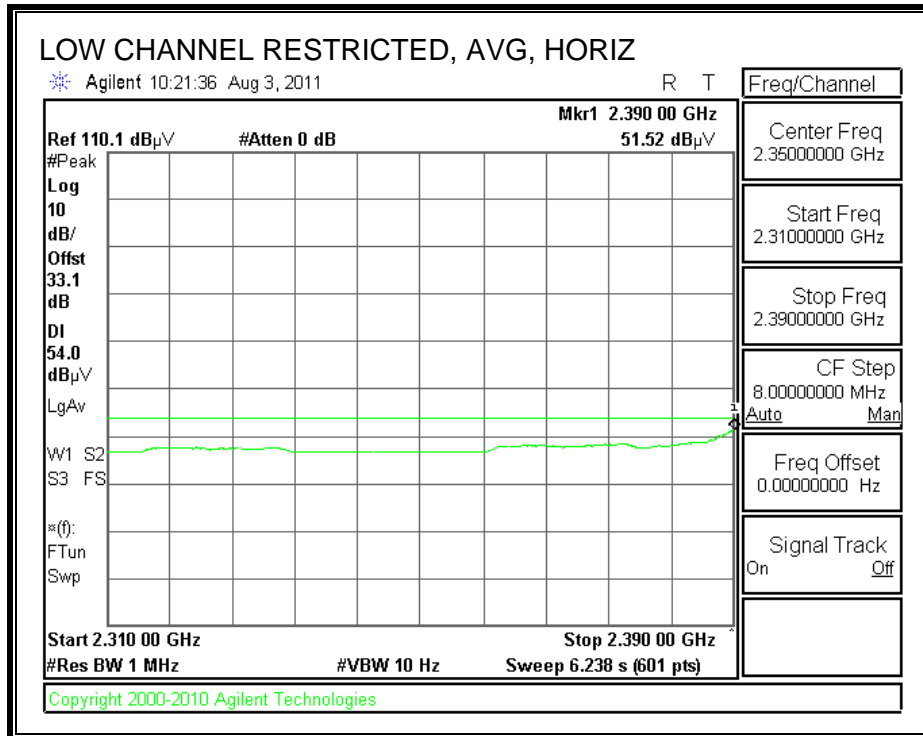
HARMONICS AND SPURIOUS EMISSIONS

| High Frequency Measurement | | | | | | | | | | | | | | | | |
|---|-----------------------|----------------|-----------------------|--------------------------------|-------|------------------------|------------------------------|----------|------------------------------|------------|---------------|----------------|-------------------|------------|-------------|--|
| Compliance Certification Services, Fremont 3m Chamber | | | | | | | | | | | | | | | | |
| Company: | | Panasonic | | | | | | | | | | | | | | |
| Project #: | | 11J13970 | | | | | | | | | | | | | | |
| Date: | | 8/4/2011 | | | | | | | | | | | | | | |
| Test Engineer: | | Tadaomi Yamano | | | | | | | | | | | | | | |
| Test Target: | | FCC 15.247 | | | | | | | | | | | | | | |
| Mode: | | Tx On, g Mode | | | | | | | | | | | | | | |
| Test Equipment: | | | | | | | | | | | | | | | | |
| Horn 1-18GHz | | | Pre-amplifier 1-26GHz | | | Pre-amplifier 26-40GHz | | | Horn > 18GHz | | | Limit | | | | |
| T60; S/N: 2238 @3m | | | T34 HP 8449B | | | | | | T125; ARA 18.26GHz; S/N:1007 | | | FCC 15.205 | | | | |
| Hi Frequency Cables | | | | | | | | | | | | | | | | |
| 3' cable 22807700 | | | 12' cable 22807600 | | | 20' cable 22807500 | | | HPF | | Reject Filter | | Peak Measurements | | | |
| 3' cable 22807700 | | | 12' cable 22807600 | | | 20' cable 22807500 | | | | | | | RBW=VBW=1MHz | | | |
| Average Measurements | | | | | | | | | | | | | | | | |
| RBW=1MHz ; VBW=10Hz | | | | | | | | | | | | | | | | |
| f GHz | Dist (m) | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Filtr dB | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes (V/H) | |
| Low Ch. 2412MHz | | | | | | | | | | | | | | | | |
| 4.824 | 3.0 | 39.8 | 27.4 | 33.9 | 6.8 | -34.1 | 0.0 | 0.0 | 46.4 | 34.0 | 74 | 54 | -27.6 | -20.0 | H | |
| 4.983 | 3.0 | 51.9 | 32.5 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 58.8 | 39.4 | 74 | 54 | -15.2 | -14.6 | H | |
| 4.824 | 3.0 | 40.0 | 27.6 | 33.9 | 6.8 | -34.1 | 0.0 | 0.0 | 46.6 | 34.2 | 74 | 54 | -27.4 | -19.8 | V | |
| 4.983 | 3.0 | 52.6 | 33.2 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 59.5 | 40.1 | 74 | 54 | -14.5 | -13.9 | V | |
| Mid Ch. 2437MHz | | | | | | | | | | | | | | | | |
| 4.874 | 3.0 | 49.9 | 37.4 | 33.9 | 6.8 | -34.0 | 0.0 | 0.0 | 56.6 | 44.1 | 74 | 54 | -17.4 | -9.9 | H | |
| 4.983 | 3.0 | 51.5 | 31.4 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 58.4 | 38.4 | 74 | 54 | -15.6 | -15.6 | H | |
| 4.874 | 3.0 | 51.2 | 37.9 | 33.9 | 6.8 | -34.0 | 0.0 | 0.0 | 57.9 | 44.6 | 74 | 54 | -16.1 | -9.4 | V | |
| 4.983 | 3.0 | 51.5 | 31.7 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 58.4 | 38.6 | 74 | 54 | -15.6 | -15.4 | V | |
| High Ch. 2462MHz | | | | | | | | | | | | | | | | |
| 4.924 | 3.0 | 40.9 | 29.5 | 34.0 | 6.8 | -34.0 | 0.0 | 0.0 | 47.7 | 36.3 | 74 | 54 | -26.3 | -17.7 | H | |
| 4.983 | 3.0 | 53.4 | 32.8 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 60.4 | 39.8 | 74 | 54 | -13.6 | -14.2 | H | |
| 4.924 | 3.0 | 45.9 | 32.1 | 34.0 | 6.8 | -34.0 | 0.0 | 0.0 | 52.7 | 38.9 | 74 | 54 | -21.3 | -15.1 | V | |
| 4.983 | 3.0 | 50.6 | 31.5 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 57.6 | 38.4 | 74 | 54 | -16.4 | -15.6 | V | |
| Rev. 07.08.11 | | | | | | | | | | | | | | | | |
| f | Measurement Frequency | | Amp | Preamp Gain | | Avg Lim | Average Field Strength Limit | | | | | | | | | |
| Dist | Distance to Antenna | | D Corr | Distance Correct to 3 meters | | Pk Lim | Peak Field Strength Limit | | | | | | | | | |
| Read | Analyzer Reading | | Avg | Average Field Strength @ 3 m | | Avg Mar | Margin vs. Average Limit | | | | | | | | | |
| AF | Antenna Factor | | Peak | Calculated Peak Field Strength | | Pk Mar | Margin vs. Peak Limit | | | | | | | | | |
| CL | Cable Loss | | HPF | High Pass Filter | | | | | | | | | | | | |

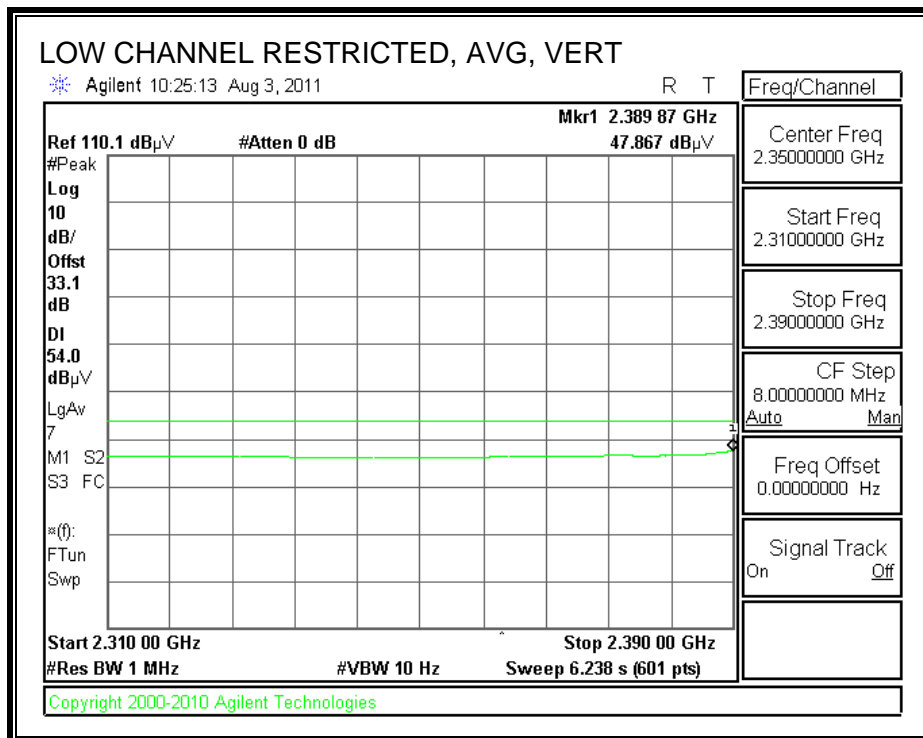
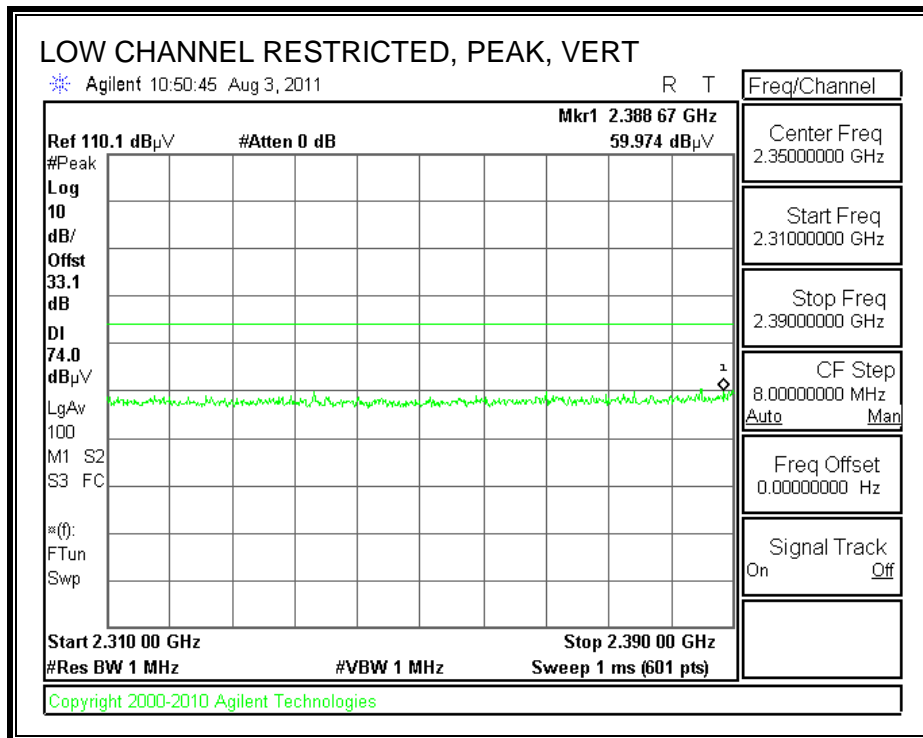
7.2.3. TX ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

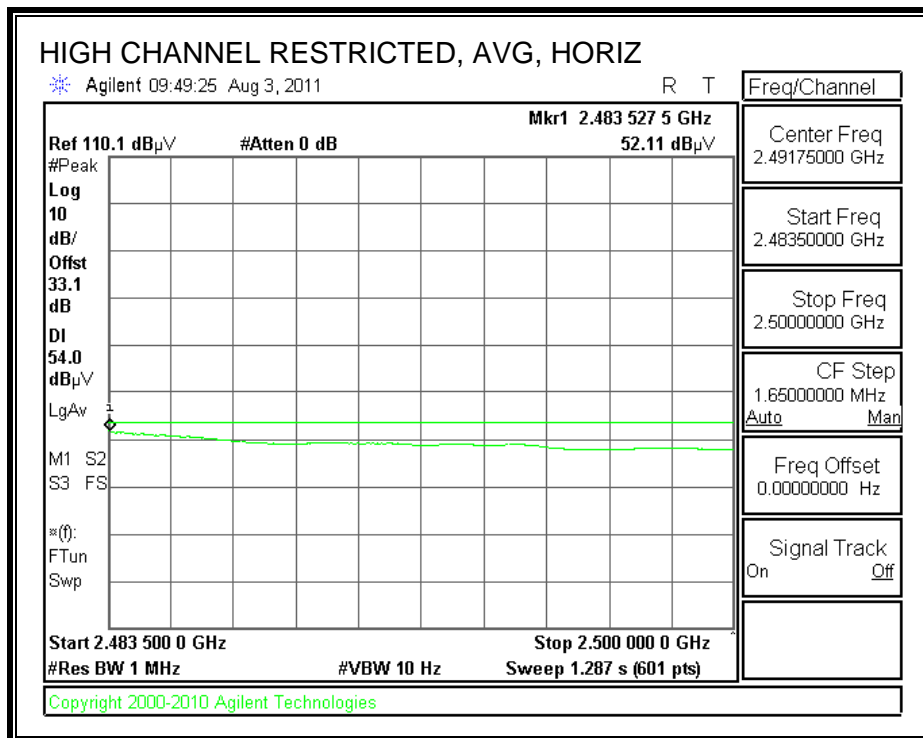
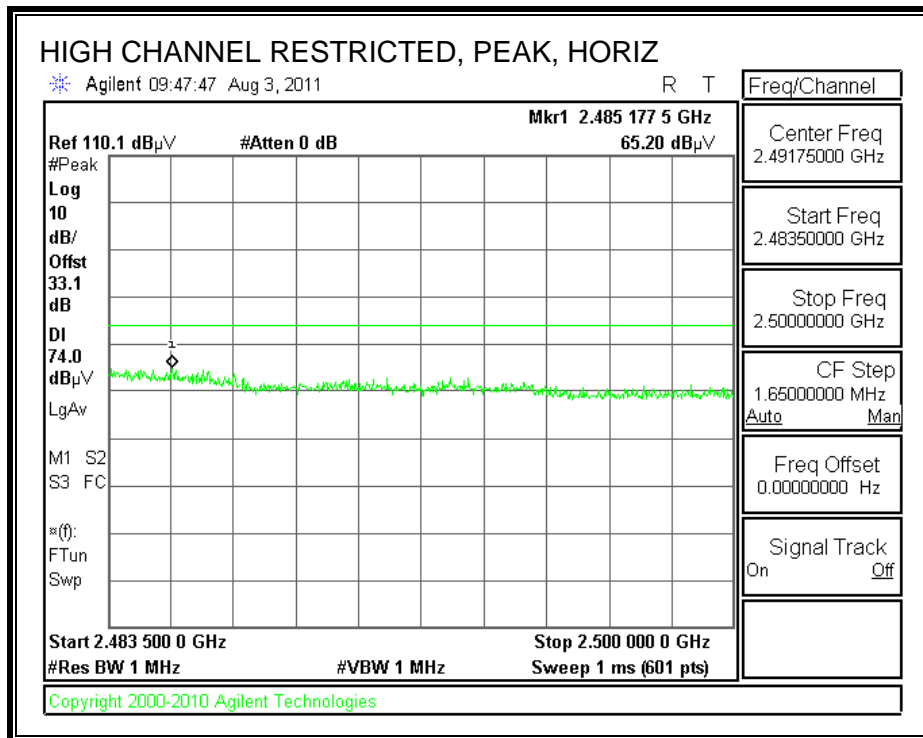




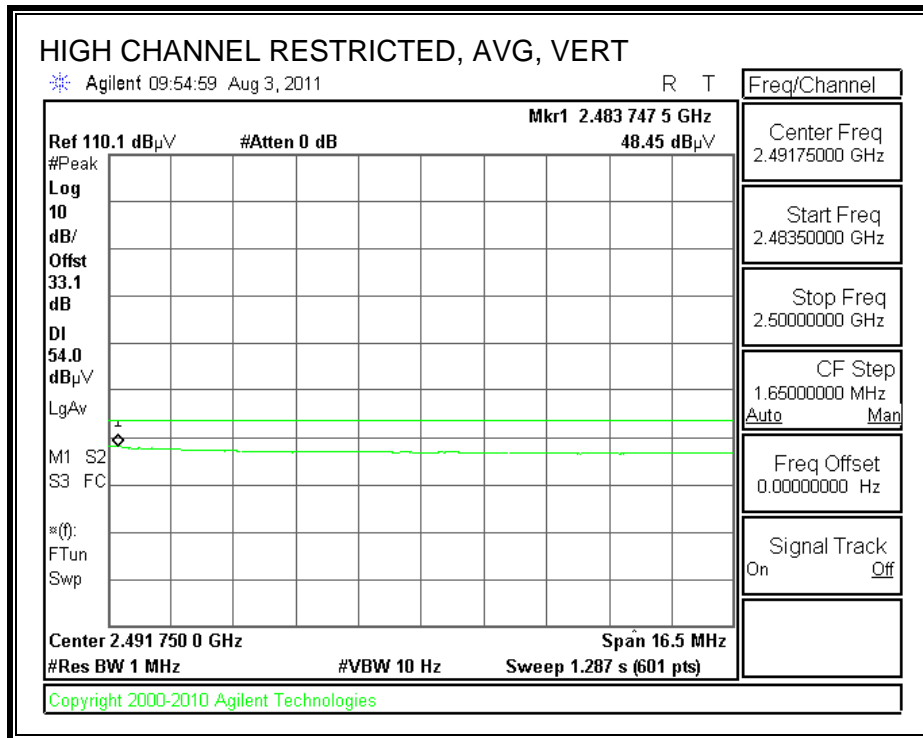
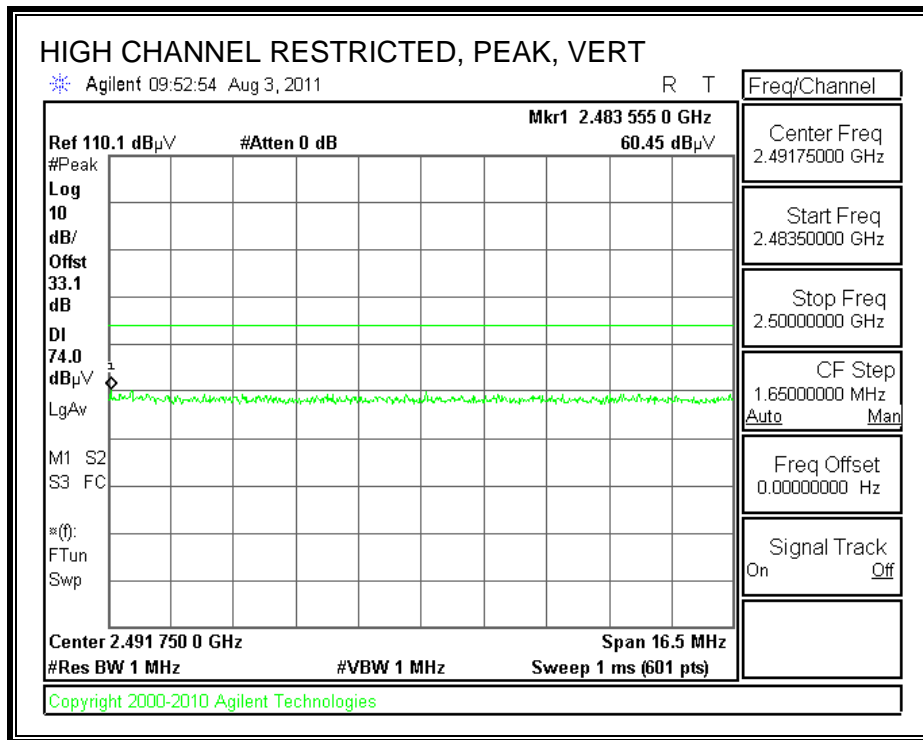
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

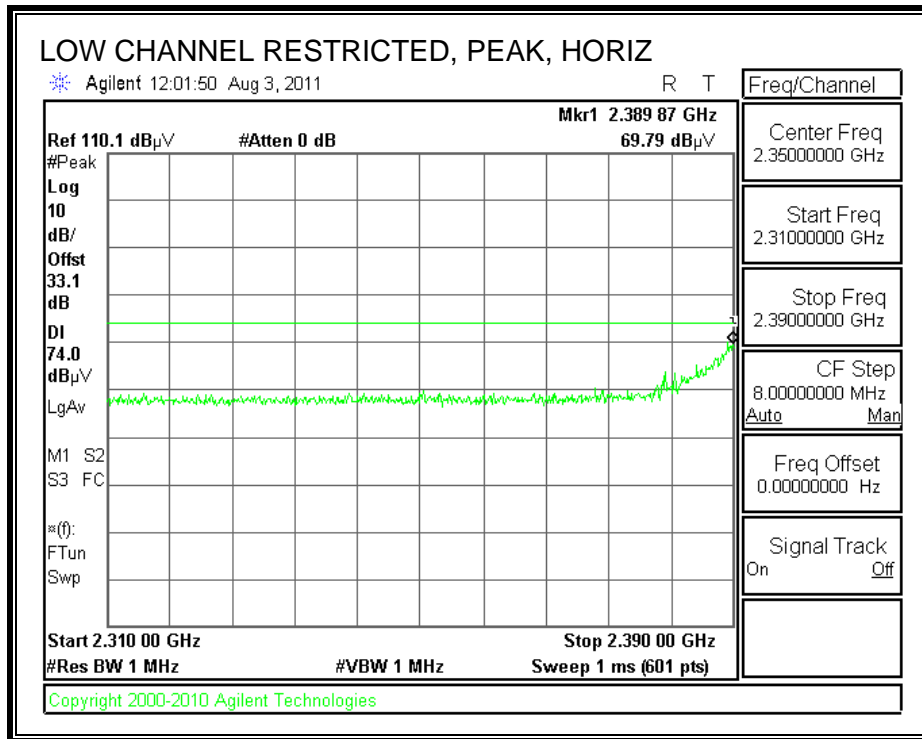


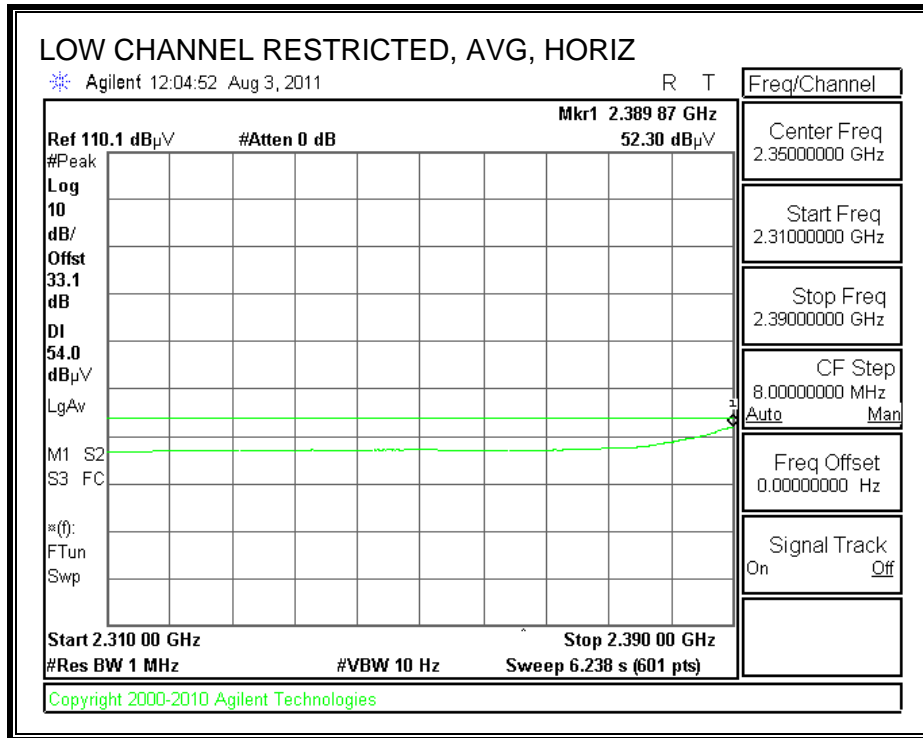
HARMONICS AND SPURIOUS EMISSIONS

| High Frequency Measurement | | | | | | | | | | | | | | | | | |
|---|-----------------------|----------------------|-----------------------|---------|-------|------------------------|--------------------------------|----------|------------------------------|------------|---------------|----------------|---|------------|-------------|--|--|
| Compliance Certification Services, Fremont 3m Chamber | | | | | | | | | | | | | | | | | |
| Company: | | Panasonic | | | | | | | | | | | | | | | |
| Project #: | | 11J13970 | | | | | | | | | | | | | | | |
| Date: | | 8/4/2011 | | | | | | | | | | | | | | | |
| Test Engineer: | | Tadaomi Yamano | | | | | | | | | | | | | | | |
| Test Target: | | FCC 15.247 | | | | | | | | | | | | | | | |
| Mode: | | Tx On, 11n HT20 Mode | | | | | | | | | | | | | | | |
| Test Equipment: | | | | | | | | | | | | | | | | | |
| Horn 1-18GHz | | | Pre-amplifier 1-26GHz | | | Pre-amplifier 26-40GHz | | | Horn > 18GHz | | | Limit | | | | | |
| T60; S/N: 2238 @3m | | | T34 HP 8449B | | | | | | T125; ARA 18-26GHz; S/N:1007 | | | FCC 15.205 | | | | | |
| Hi Frequency Cables | | | | | | | | | | | | | | | | | |
| 3' cable 22807700 | | | 12' cable 22807600 | | | 20' cable 22807500 | | | HPF | | Reject Filter | | Peak Measurements RBW=VBW=1MHz | | | | |
| 3' cable 22807700 | | | 12' cable 22807600 | | | 20' cable 22807500 | | | | | | | Average Measurements RBW=1MHz ; VBW=10Hz | | | | |
| f GHz | Dist (m) | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Filtr dB | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes (V/H) | | |
| Low Ch. 2412MHz | | | | | | | | | | | | | | | | | |
| 4.824 | 3.0 | 40.5 | 28.2 | 33.9 | 6.8 | -34.1 | 0.0 | 0.0 | 47.1 | 34.8 | 74 | 54 | -26.9 | -19.2 | H | | |
| 4.983 | 3.0 | 51.9 | 32.5 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 58.8 | 39.4 | 74 | 54 | -15.2 | -14.6 | H | | |
| 4.824 | 3.0 | 39.5 | 27.4 | 33.9 | 6.8 | -34.1 | 0.0 | 0.0 | 46.1 | 34.0 | 74 | 54 | -27.9 | -20.0 | V | | |
| 4.983 | 3.0 | 51.0 | 32.9 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 57.9 | 39.8 | 74 | 54 | -16.1 | -14.2 | V | | |
| Mid Ch. 2437MHz | | | | | | | | | | | | | | | | | |
| 4.874 | 3.0 | 48.8 | 33.7 | 33.9 | 6.8 | -34.0 | 0.0 | 0.0 | 55.5 | 40.4 | 74 | 54 | -18.5 | -13.6 | H | | |
| 4.983 | 3.0 | 53.7 | 30.9 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 60.6 | 37.8 | 74 | 54 | -13.4 | -16.2 | H | | |
| 4.874 | 3.0 | 44.7 | 30.3 | 33.9 | 6.8 | -34.0 | 0.0 | 0.0 | 51.4 | 37.0 | 74 | 54 | -22.6 | -17.0 | V | | |
| 4.983 | 3.0 | 52.6 | 32.6 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 59.6 | 39.5 | 74 | 54 | -14.4 | -14.5 | V | | |
| High Ch. 2462MHz | | | | | | | | | | | | | | | | | |
| 4.924 | 3.0 | 40.9 | 27.7 | 34.0 | 6.8 | -34.0 | 0.0 | 0.0 | 47.7 | 34.4 | 74 | 54 | -26.3 | -19.6 | H | | |
| 4.983 | 3.0 | 50.5 | 33.0 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 57.4 | 39.9 | 74 | 54 | -16.6 | -14.1 | H | | |
| 4.924 | 3.0 | 40.2 | 28.4 | 34.0 | 6.8 | -34.0 | 0.0 | 0.0 | 47.0 | 35.2 | 74 | 54 | -27.0 | -18.8 | V | | |
| 4.983 | 3.0 | 53.2 | 31.4 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 60.1 | 38.3 | 74 | 54 | -13.9 | -15.7 | V | | |
| Rev. 07.08.11 | | | | | | | | | | | | | | | | | |
| f | Measurement Frequency | | | | | Amp | Preamp Gain | | | | | Avg Lim | Average Field Strength Limit | | | | |
| Dist | Distance to Antenna | | | | | D Corr | Distance Correct to 3 meters | | | | | Pk Lim | Peak Field Strength Limit | | | | |
| Read | Analyzer Reading | | | | | Avg | Average Field Strength @ 3 m | | | | | Avg Mar | Margin vs. Average Limit | | | | |
| AF | Antenna Factor | | | | | Peak | Calculated Peak Field Strength | | | | | Pk Mar | Margin vs. Peak Limit | | | | |
| CL | Cable Loss | | | | | HPF | High Pass Filter | | | | | | | | | | |

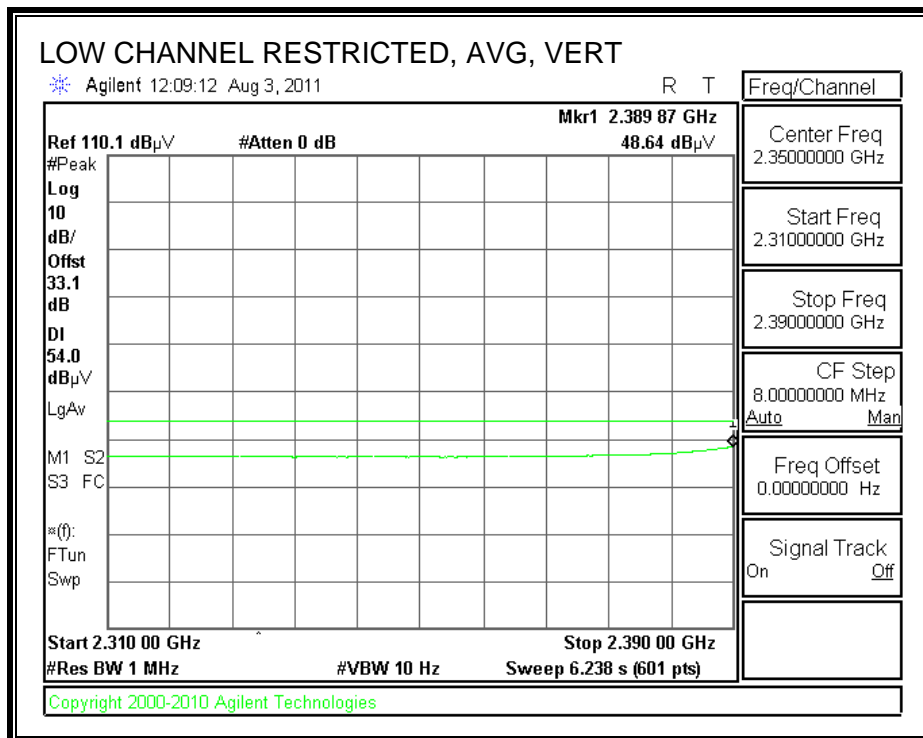
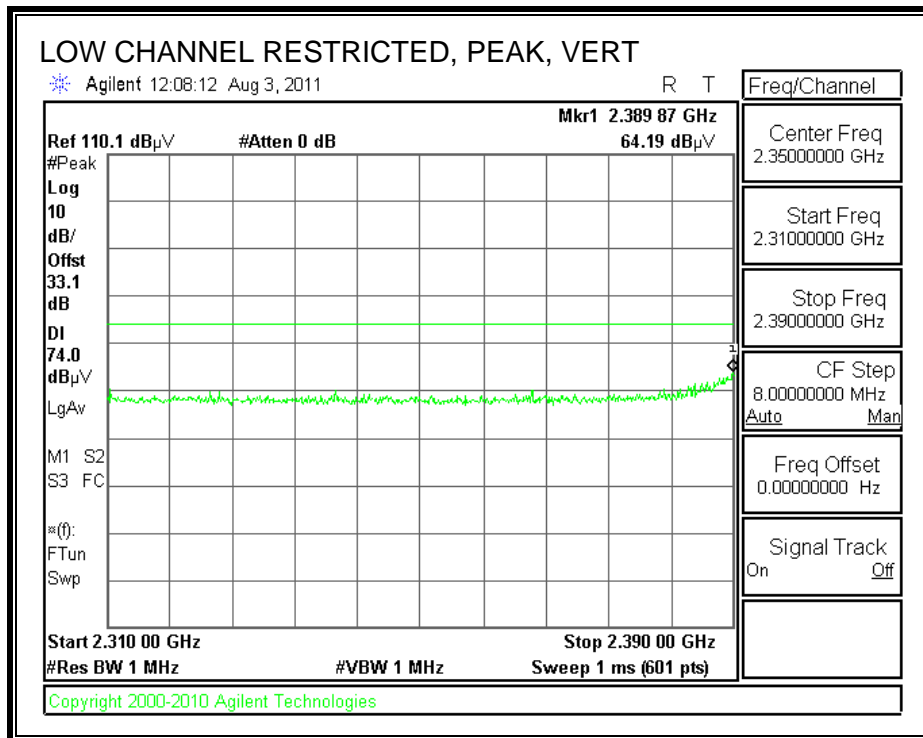
7.2.4. TX ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

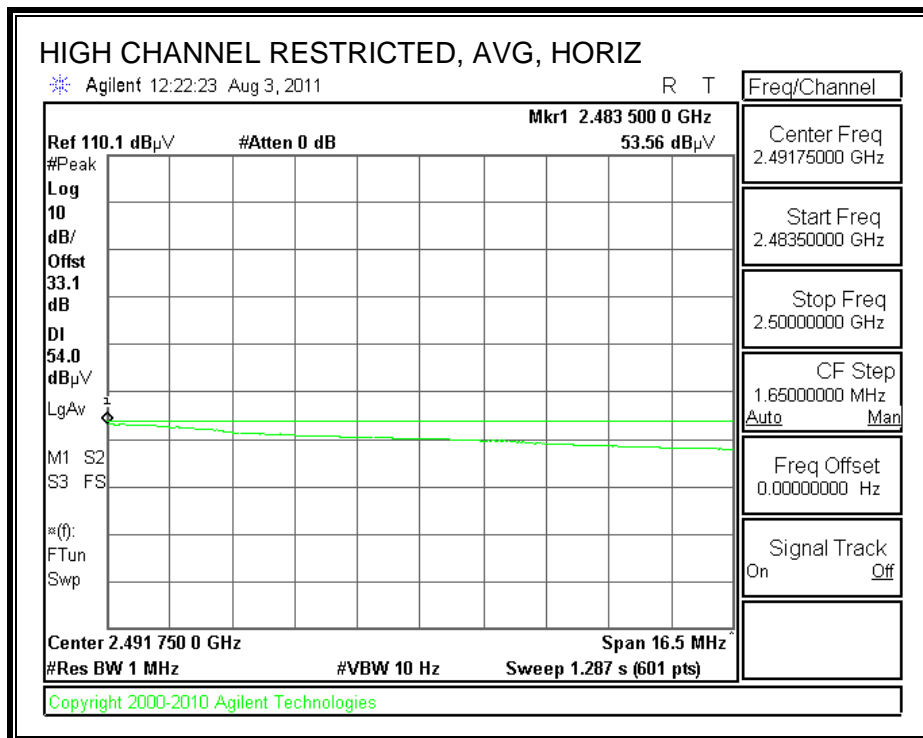
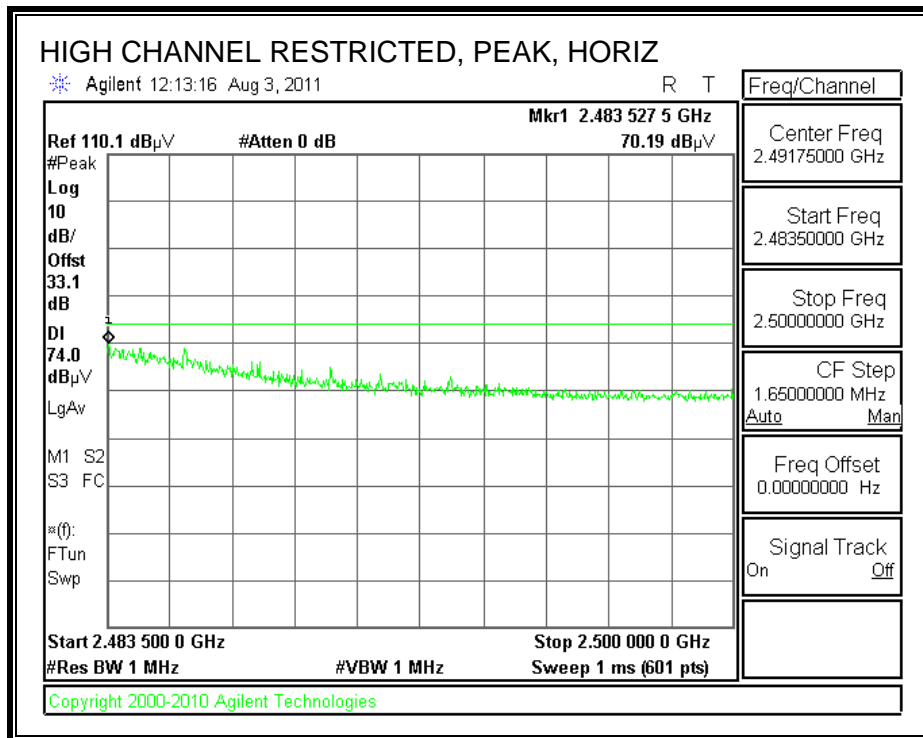




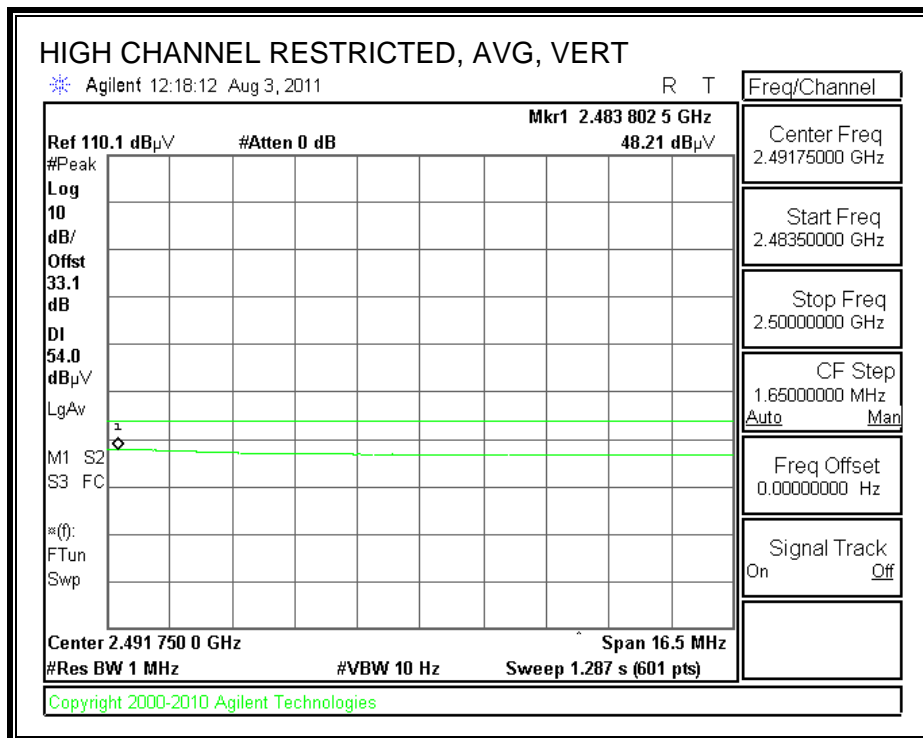
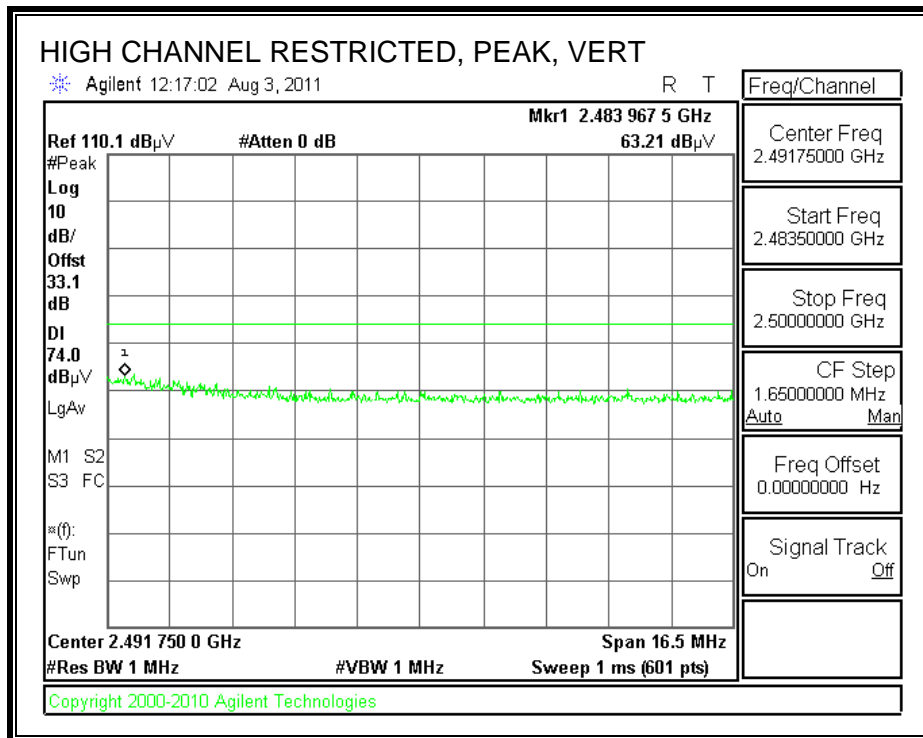
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
 Compliance Certification Services, Fremont 3m Chamber

Company: Panasonic
 Project #: 11J13970
 Date: 8/4/2011
 Test Engineer: Tadaomi Yamano
 Test Target: FCC 15.247
 Mode: Tx On, 11n HT40 Mode

Test Equipment:

| | | | | |
|---------------------|------------------------------|-------------------------------|------------------------------|--------------|
| Horn 1-18GHz | Pre-amplifier 1-26GHz | Pre-amplifier 26-40GHz | Horn > 18GHz | Limit |
| T60; S/N: 2238 @3m | T34 HP 8449B | | T125; ARA 18-26GHz; S/N:1007 | FCC 15.205 |

Hi Frequency Cables

| | | | | | |
|--------------------------|---------------------------|---------------------------|------------|----------------------|--|
| 3' cable 22807700 | 12' cable 22807600 | 20' cable 22807500 | HPF | Reject Filter | Peak Measurements RBW=VBW=1MHz |
| 3' cable 22807700 | 12' cable 22807600 | 20' cable 22807500 | | | Average Measurements RBW=1MHz ; VBW=10Hz |

| f GHz | Dist (m) | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Filtr dB | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes (V/H) |
|-------------------------|-------------|-----------------|-------------------|------------|----------|-----------|--------------|-------------|----------------|---------------|------------------|-------------------|--------------|---------------|----------------|
| Low Ch. 2412MHz | | | | | | | | | | | | | | | |
| 4.844 | 3.0 | 39.9 | 26.5 | 33.9 | 6.8 | -34.0 | 0.0 | 0.0 | 46.6 | 33.2 | 74 | 54 | -27.4 | -20.8 | H |
| 4.983 | 3.0 | 49.5 | 30.1 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 56.5 | 37.0 | 74 | 54 | -17.5 | -17.0 | H |
| 4.844 | 3.0 | 39.5 | 26.8 | 33.9 | 6.8 | -34.0 | 0.0 | 0.0 | 46.1 | 33.5 | 74 | 54 | -27.9 | -20.5 | V |
| 4.983 | 3.0 | 50.1 | 29.8 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 57.0 | 36.8 | 74 | 54 | -17.0 | -17.2 | V |
| Mid Ch. 2437MHz | | | | | | | | | | | | | | | |
| 4.874 | 3.0 | 42.4 | 28.5 | 33.9 | 6.8 | -34.0 | 0.0 | 0.0 | 49.1 | 35.2 | 74 | 54 | -24.9 | -18.8 | H |
| 4.983 | 3.0 | 54.0 | 31.6 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 60.9 | 38.5 | 74 | 54 | -13.1 | -15.5 | H |
| 4.874 | 3.0 | 39.4 | 27.6 | 33.9 | 6.8 | -34.0 | 0.0 | 0.0 | 46.1 | 34.3 | 74 | 54 | -27.9 | -19.7 | V |
| 4.983 | 3.0 | 53.4 | 31.8 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 60.3 | 38.7 | 74 | 54 | -13.7 | -15.3 | V |
| High Ch. 2462MHz | | | | | | | | | | | | | | | |
| 4.904 | 3.0 | 39.4 | 27.0 | 34.0 | 6.8 | -34.0 | 0.0 | 0.0 | 46.2 | 33.7 | 74 | 54 | -27.8 | -20.3 | H |
| 4.983 | 3.0 | 53.6 | 31.0 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 60.5 | 37.9 | 74 | 54 | -13.5 | -16.1 | H |
| 4.904 | 3.0 | 39.6 | 26.7 | 34.0 | 6.8 | -34.0 | 0.0 | 0.0 | 46.4 | 33.5 | 74 | 54 | -27.6 | -20.5 | V |
| 4.983 | 3.0 | 52.0 | 34.4 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 58.9 | 41.4 | 74 | 54 | -15.1 | -12.6 | V |

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

7.3. RECEIVER ABOVE 1 GHz

High Frequency Measurement
 Compliance Certification Services, Fremont 3m Chamber

Company: **Panasonic**
 Project #: **11J13970**
 Date: **8/4/2011**
 Test Engineer: **Tadaomi Yamano**
 Test Target: **FCC 15.247**
 Mode: **Rx, 11g Mode Mid ch**

Test Equipment:

| | | | | |
|---------------------|-----------------------------|------------------------------|------------------------|--------------|
| Horn 1-18GHz | Pre-amplifer 1-26GHz | Pre-amplifer 26-40GHz | Horn > 18GHz | Limit |
| T60; S/N: 2238 @3m | T34 HP 8449B | | | RX RSS 210 |

Hi Frequency Cables

| | | | | | |
|--------------------------|---------------------------|---------------------------|------------|----------------------|--|
| 3' cable 22807700 | 12' cable 22807600 | 20' cable 22807500 | HPF | Reject Filter | Peak Measurements RBW=VBW=1MHz |
| 3' cable 22807700 | 12' cable 22807600 | 20' cable 22807500 | | | Average Measurements RBW=1MHz ; VBW=10Hz |

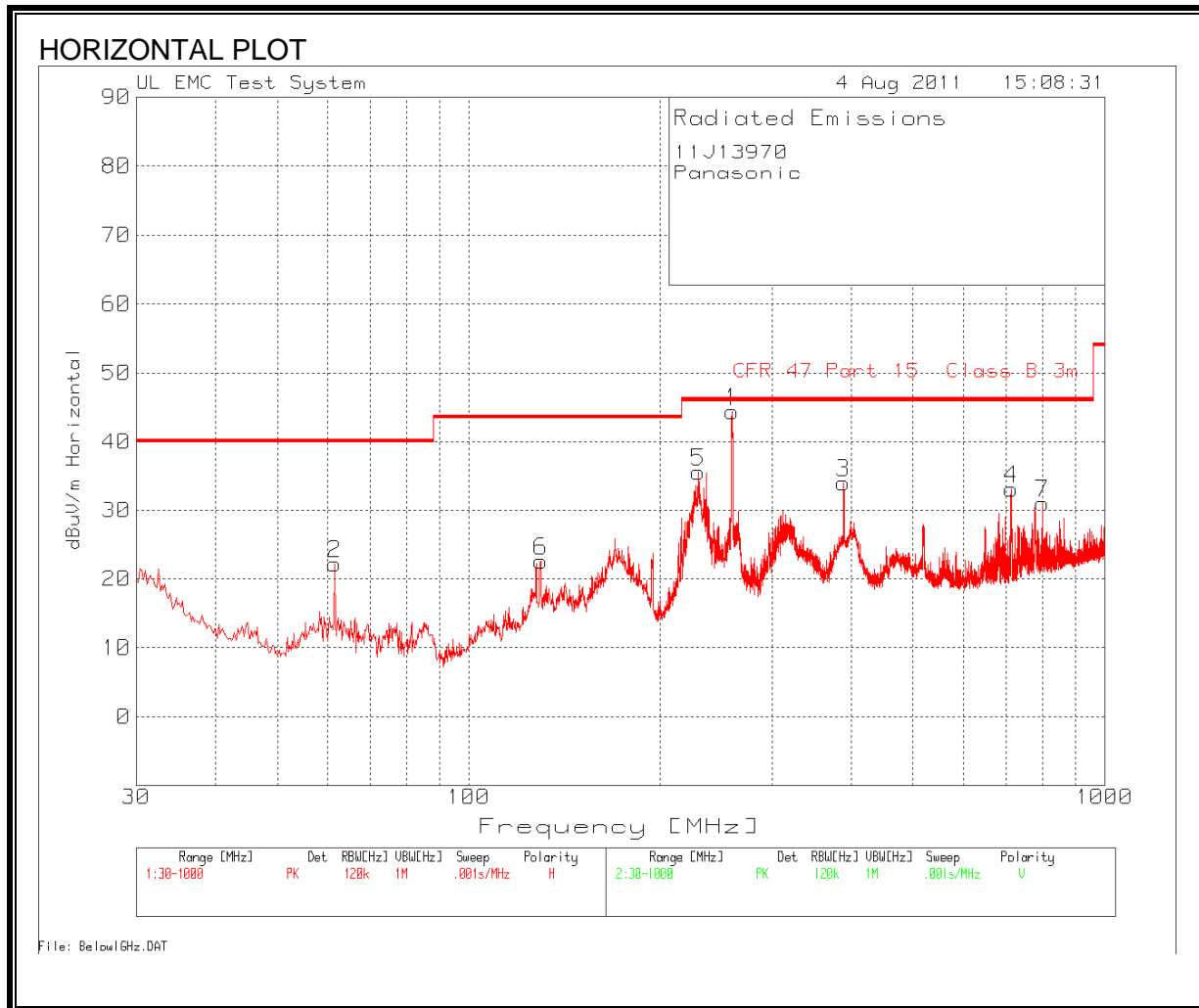
| f GHz | Dist (m) | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fltr dB | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes (V/H) |
|----------|-------------|-----------------|-------------------|------------|----------|-----------|--------------|------------|----------------|---------------|------------------|-------------------|--------------|---------------|----------------|
| 1.595 | 3.0 | 58.1 | 40.1 | 26.9 | 3.5 | -36.9 | 0.0 | 0.0 | 51.6 | 33.6 | 74 | 54 | -22.4 | -20.4 | H |
| 2.493 | 3.0 | 53.2 | 36.3 | 29.0 | 4.6 | -35.6 | 0.0 | 0.0 | 51.2 | 34.3 | 74 | 54 | -22.8 | -19.7 | H |
| 2.657 | 3.0 | 54.0 | 33.8 | 29.5 | 4.8 | -35.5 | 0.0 | 0.0 | 52.8 | 32.5 | 74 | 54 | -21.2 | -21.5 | H |
| 4.983 | 3.0 | 51.5 | 33.4 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 58.4 | 40.3 | 74 | 54 | -15.6 | -13.7 | H |
| 1.595 | 3.0 | 52.2 | 35.8 | 26.9 | 3.5 | -36.9 | 0.0 | 0.0 | 45.7 | 29.2 | 74 | 54 | -28.3 | -24.8 | V |
| 2.493 | 3.0 | 47.4 | 32.2 | 29.0 | 4.6 | -35.6 | 0.0 | 0.0 | 45.4 | 30.2 | 74 | 54 | -28.6 | -23.8 | V |
| 2.657 | 3.0 | 52.4 | 32.5 | 29.5 | 4.8 | -35.5 | 0.0 | 0.0 | 51.1 | 31.2 | 74 | 54 | -22.9 | -22.8 | V |
| 4.983 | 3.0 | 52.7 | 34.2 | 34.0 | 6.9 | -34.0 | 0.0 | 0.0 | 59.6 | 41.1 | 74 | 54 | -14.4 | -12.9 | V |

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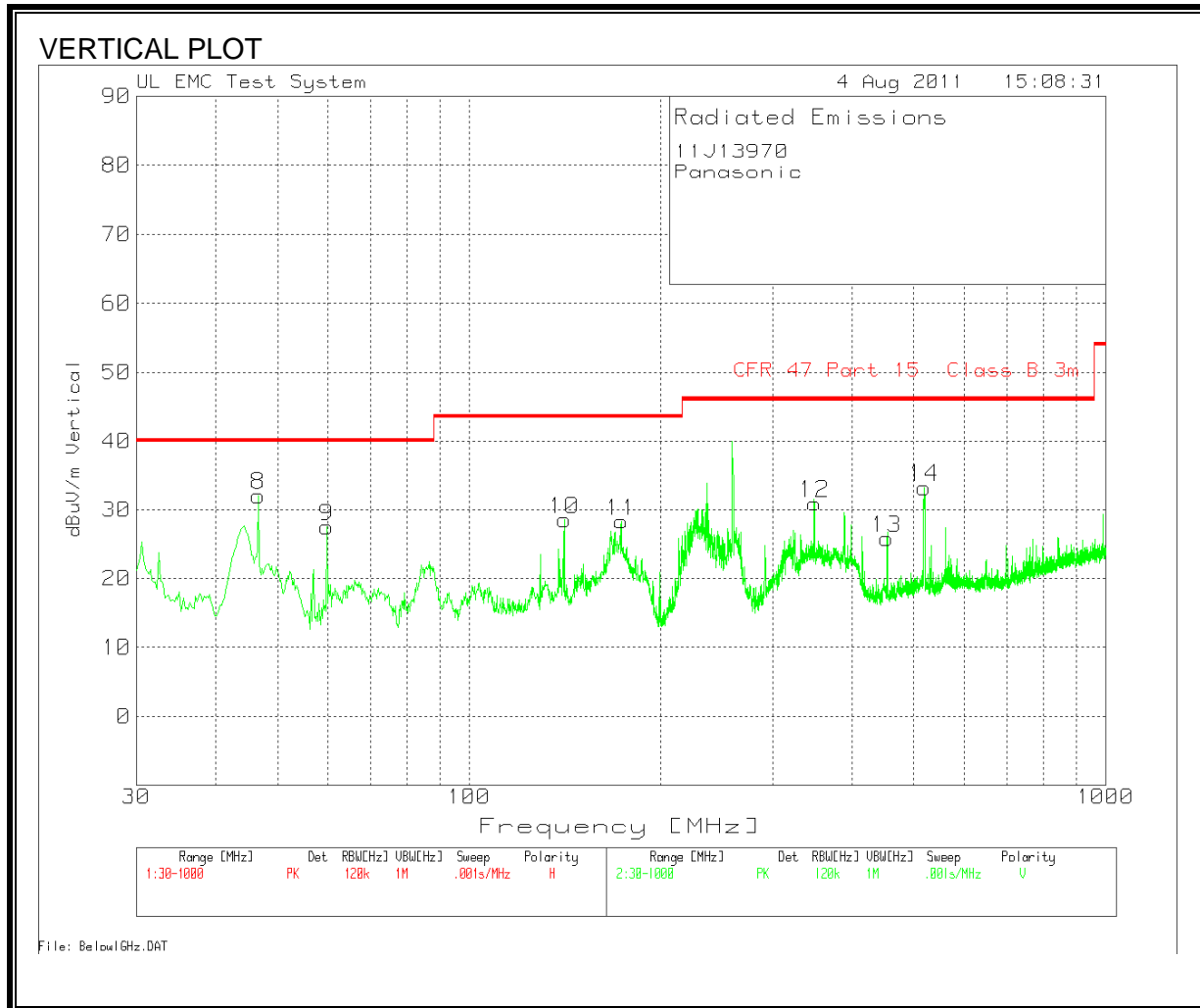
| | | | | | |
|------|-----------------------|--------|--------------------------------|---------|------------------------------|
| f | Measurement Frequency | Amp | Preamp Gain | Avg Lim | Average Field Strength Limit |
| Dist | Distance to Antenna | D Corr | Distance Correct to 3 meters | Pk Lim |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

7.4. RADIATED BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (HORIZONTAL)



SPURIOUS EMISSIONS 30 TO 1000 MHz (VERTICAL)



TABULATED DATA

| Horizontal 30 - 1000MHz | | | | | | | | | | |
|-------------------------|---------------|----------|------------|-------------|-----------------|--------|-----------------|--------|-------------|----------|
| Test Frequency | Meter Reading | Detector | Cable [dB] | PreAmp [dB] | Bilog T185 [dB] | dBuV/m | Part 15 Class B | Margin | Height [cm] | Polarity |
| 259.9001 | 58.06 | PK | 1.6 | -27.4 | 12.1 | 44.36 | 46 | -1.64 | 100 | Horz |
| 61.5967 | 41.45 | PK | 0.9 | -28.2 | 8 | 22.15 | 40 | -17.85 | 100 | Horz |
| 388.2254 | 44.96 | PK | 2.1 | -27.8 | 14.8 | 34.06 | 46 | -11.94 | 176 | Horz |
| 714.8541 | 39.5 | PK | 2.8 | -28.3 | 19.2 | 33.2 | 46 | -12.8 | 100 | Horz |
| 229.6603 | 49.83 | PK | 1.5 | -27.5 | 11.8 | 35.63 | 46 | -10.37 | 100 | Horz |
| 129.8301 | 35.55 | PK | 1.1 | -27.9 | 13.8 | 22.55 | 43.5 | -20.95 | 251 | Horz |
| 798.2074 | 35.35 | PK | 2.9 | -28 | 20.8 | 31.05 | 46 | -14.95 | 100 | Horz |

| Vertical 30 - 1000MHz | | | | | | | | | | |
|-----------------------|---------------|----------|------------|-------------|-----------------|--------|-----------------|--------|-------------|----------|
| Test Frequency | Meter Reading | Detector | Cable [dB] | PreAmp [dB] | Bilog T185 [dB] | dBuV/m | Part 15 Class B | Margin | Height [cm] | Polarity |
| 46.6707 | 48.68 | PK | 0.7 | -28.2 | 10.9 | 32.08 | 40 | -7.92 | 100 | Vert |
| 59.8521 | 47 | PK | 0.8 | -28.2 | 7.9 | 27.5 | 40 | -12.5 | 100 | Vert |
| 141.0731 | 42.12 | PK | 1.2 | -27.9 | 13.1 | 28.52 | 43.5 | -14.98 | 100 | Vert |
| 173.4452 | 44.23 | PK | 1.3 | -27.8 | 10.6 | 28.33 | 43.5 | -15.17 | 100 | Vert |
| 349.2626 | 42.49 | PK | 1.9 | -27.6 | 14.2 | 30.99 | 46 | -15.01 | 100 | Vert |
| 452.9696 | 35.75 | PK | 2.2 | -28.2 | 16 | 25.75 | 46 | -20.25 | 100 | Vert |
| 519.0707 | 42.25 | PK | 2.3 | -28.5 | 17.2 | 33.25 | 46 | -12.75 | 100 | Vert |

8. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

| Frequency of Emission (MHz) | Conducted Limit (dBuV) | |
|-----------------------------|------------------------|-----------|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

*Decreases with the logarithm of the frequency.

TEST PROCEDURE

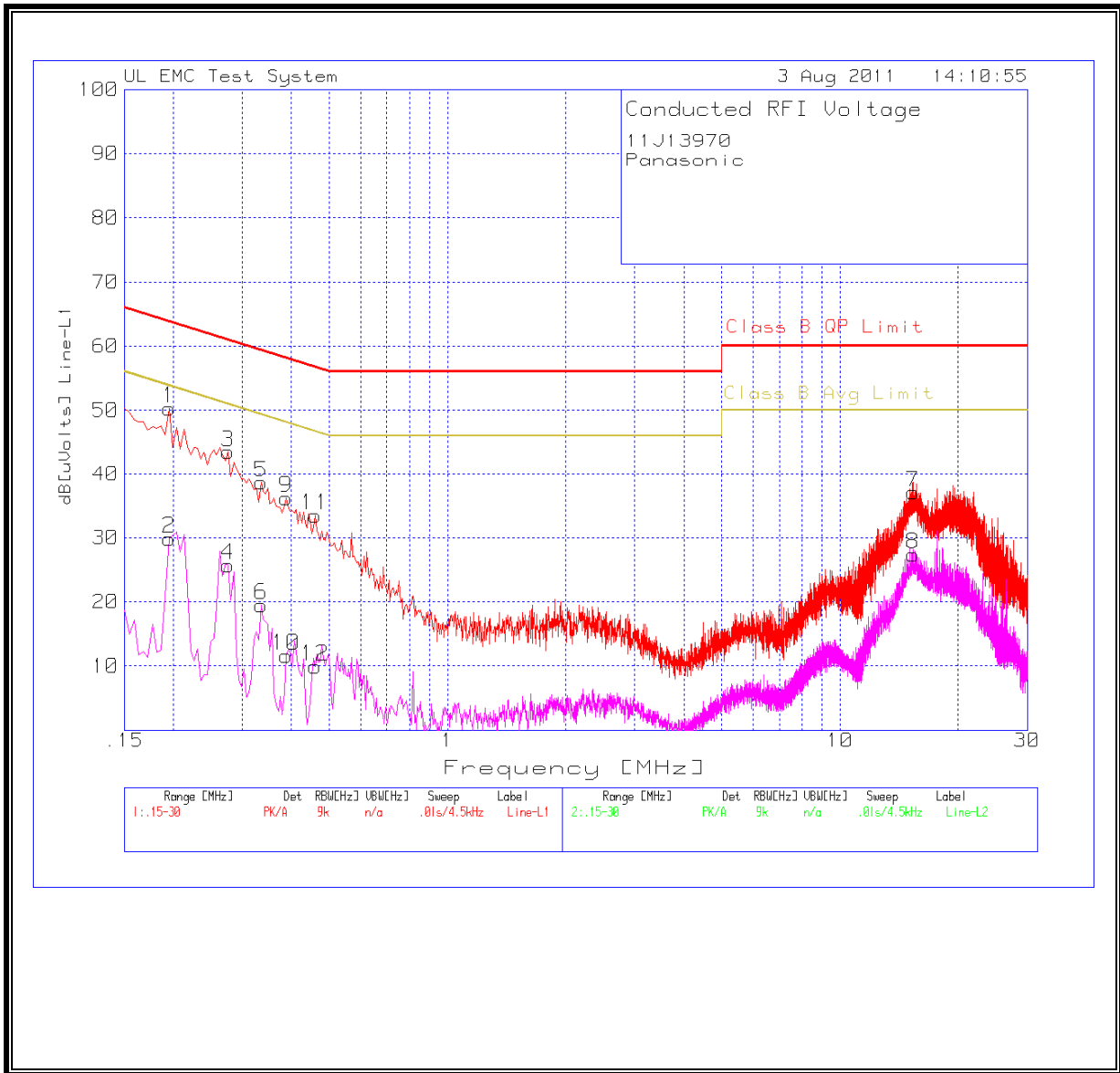
ANSI C63.4

RESULTS

6 WORST EMISSIONS

| Line-L1 .15 - 30MHz | | | | | | | | | |
|---------------------|---------------|----------|-----------|------------|------------|------------------|--------|-------------------|--------|
| Test Frequency | Meter Reading | Detector | LISN [dB] | Cable [dB] | dB[uVolts] | Class B QP Limit | Margin | Class B Avg Limit | Margin |
| 0.195 | 50.27 | PK | 0 | 0 | 50.27 | 63.8 | -13.53 | 53.8 | -3.53 |
| 0.195 | 29.81 | Av | 0 | 0 | 29.81 | 63.8 | -33.99 | 53.8 | -23.99 |
| 0.276 | 43.5 | PK | 0 | 0 | 43.5 | 60.9 | -17.4 | 50.9 | -7.4 |
| 0.276 | 25.71 | Av | 0 | 0 | 25.71 | 60.9 | -35.19 | 50.9 | -25.19 |
| 0.3345 | 38.66 | PK | 0 | 0 | 38.66 | 59.3 | -20.64 | 49.3 | -10.64 |
| 0.3345 | 19.55 | Av | 0 | 0 | 19.55 | 59.3 | -39.75 | 49.3 | -29.75 |
| 15.369 | 37.04 | PK | 0 | 0 | 37.04 | 60 | -22.96 | 50 | -12.96 |
| 15.369 | 27.35 | Av | 0 | 0 | 27.35 | 60 | -32.65 | 50 | -22.65 |
| 0.3885 | 36.15 | PK | 0 | 0 | 36.15 | 58.1 | -21.95 | 48.1 | -11.95 |
| 0.3885 | 11.62 | Av | 0 | 0 | 11.62 | 58.1 | -46.48 | 48.1 | -36.48 |
| 0.4605 | 33.47 | PK | 0 | 0 | 33.47 | 56.7 | -23.23 | 46.7 | -13.23 |
| 0.4605 | 9.9 | Av | 0 | 0 | 9.9 | 56.7 | -46.8 | 46.7 | -36.8 |
| Line-L2 .15 - 30MHz | | | | | | | | | |
| Test Frequency | Meter Reading | Detector | LISN [dB] | Cable [dB] | dB[uVolts] | Class B QP Limit | Margin | Class B Avg Limit | Margin |
| 0.204 | 48.17 | PK | 0 | 0 | 48.17 | 63.4 | -15.23 | 53.4 | -5.23 |
| 0.204 | 33.21 | Av | 0 | 0 | 33.21 | 63.4 | -30.19 | 53.4 | -20.19 |
| 0.258 | 43.09 | PK | 0 | 0 | 43.09 | 61.5 | -18.41 | 51.5 | -8.41 |
| 0.258 | 21.25 | Av | 0 | 0 | 21.25 | 61.5 | -40.25 | 51.5 | -30.25 |
| 0.339 | 39.77 | PK | 0 | 0 | 39.77 | 59.2 | -19.43 | 49.2 | -9.43 |
| 0.339 | 16.62 | Av | 0 | 0 | 16.62 | 59.2 | -42.58 | 49.2 | -32.58 |
| 0.3975 | 34.51 | PK | 0 | 0 | 34.51 | 57.9 | -23.39 | 47.9 | -13.39 |
| 0.3975 | 12.76 | Av | 0 | 0 | 12.76 | 57.9 | -45.14 | 47.9 | -35.14 |
| 0.4695 | 31.94 | PK | 0 | 0 | 31.94 | 56.5 | -24.56 | 46.5 | -14.56 |
| 0.4695 | 13.83 | Av | 0 | 0 | 13.83 | 56.5 | -42.67 | 46.5 | -32.67 |
| 15.333 | 35.18 | PK | 0 | 0 | 35.18 | 60 | -24.82 | 50 | -14.82 |
| 15.333 | 25.06 | Av | 0 | 0 | 25.06 | 60 | -34.94 | 50 | -24.94 |

LINE 1 RESULTS



LINE 2 RESULTS

