



**FCC CFR47 PART 15 SUBPART C  
INDUSTRY CANADA RSS-210 ISSUE 7**

**CERTIFICATION TEST REPORT**

**FOR**

**802.11B/G/N WLAN MODULE**

**MODEL NUMBER: DWM-W038**

**FCC ID: AK8DWMW038  
IC: 409B-DWMW038**

**REPORT NUMBER: 10J13147-1**

**ISSUE DATE: APRIL 13, 2010**

*Prepared for*

**SONY CORPORATION  
1-7-1 KONAN, MINATO-KU, TOKYO  
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**NVLAP LAB CODE 200065-0**

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SONY CORPORATION  
1-7-1 KONAN, MINATO-KU, TOKYO 108-0075, JAPAN

**EUT DESCRIPTION:** 802.11B/G/N WLAN MODULE

**MODEL:** DWM-W038

**SERIAL NUMBER:** 100330A0001

**DATE TESTED:** FEBRUARY 09 – APRIL 13, 2010

| APPLICABLE STANDARDS                    |              |
|---|--------------|
| STANDARD                                | TEST RESULTS |
| CFR 47 Part 15 Subpart C                | Pass         |
| INDUSTRY CANADA RSS-210 Issue 7 Annex 8 | Pass         |
| INDUSTRY CANADA RSS-GEN Issue 2         | Pass         |

Compliance Certification Services, Inc. (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 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by 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 CCS By:

Tested By:



THU CHAN  
EMC MANAGER  
COMPLIANCE CERTIFICATION SERVICES

THANH NGUYEN  
EMC ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

## 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 2, and RSS-210 Issue 7.

## 3. FACILITIES AND ACCREDITATION

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

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 WLAN module, was manufactured by Atheros.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

| Frequency Range (MHz) | Mode    | Output Power (dBm) | Output Power (mW) |
|-----------------------|---------|--------------------|-------------------|
| 2412 - 2462           | 802.11b | 17.43              | 55.34             |
| 2412 - 2462           | 802.11g | 22.37              | 172.58            |
| 2412 - 2462           | HT20    | 23.64              | 231.21            |

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes the build in antenna with maximum gain is 0.33dBi.

### 5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was Atheros radio Test (ART), Version0.8 BUILD#119 Art \_11n.

### 5.5. WORST-CASE CONFIGURATION AND MODE

The EUT was tested as an external module installed connected to a host Laptop PC via USB cable.

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:

802.11b Mode (20 MHz BW operation): 11 Mbps, CCK.  
802.11g Mode (20 MHz BW operation): 6 Mbps, OFDM.  
802.11n HT20 Mode (20 MHz BW operation): MCS0, OFDM.

For radiated emissions below 1 GHz the worst-case configuration is determined to be the mode and channel with the highest output power.

## 5.6. DESCRIPTION OF TEST SETUP

### 5.6.1. Radiated Emissions

#### SUPPORT EQUIPMENT

| PERIPHERAL SUPPORT EQUIPMENT LIST |              |            |               |
|-----------------------------------|--------------|------------|---------------|
| Description                       | Manufacturer | Model      | Serial Number |
| JIG Interface                     | Mitsumi      | MDK 338-OW | N/A           |

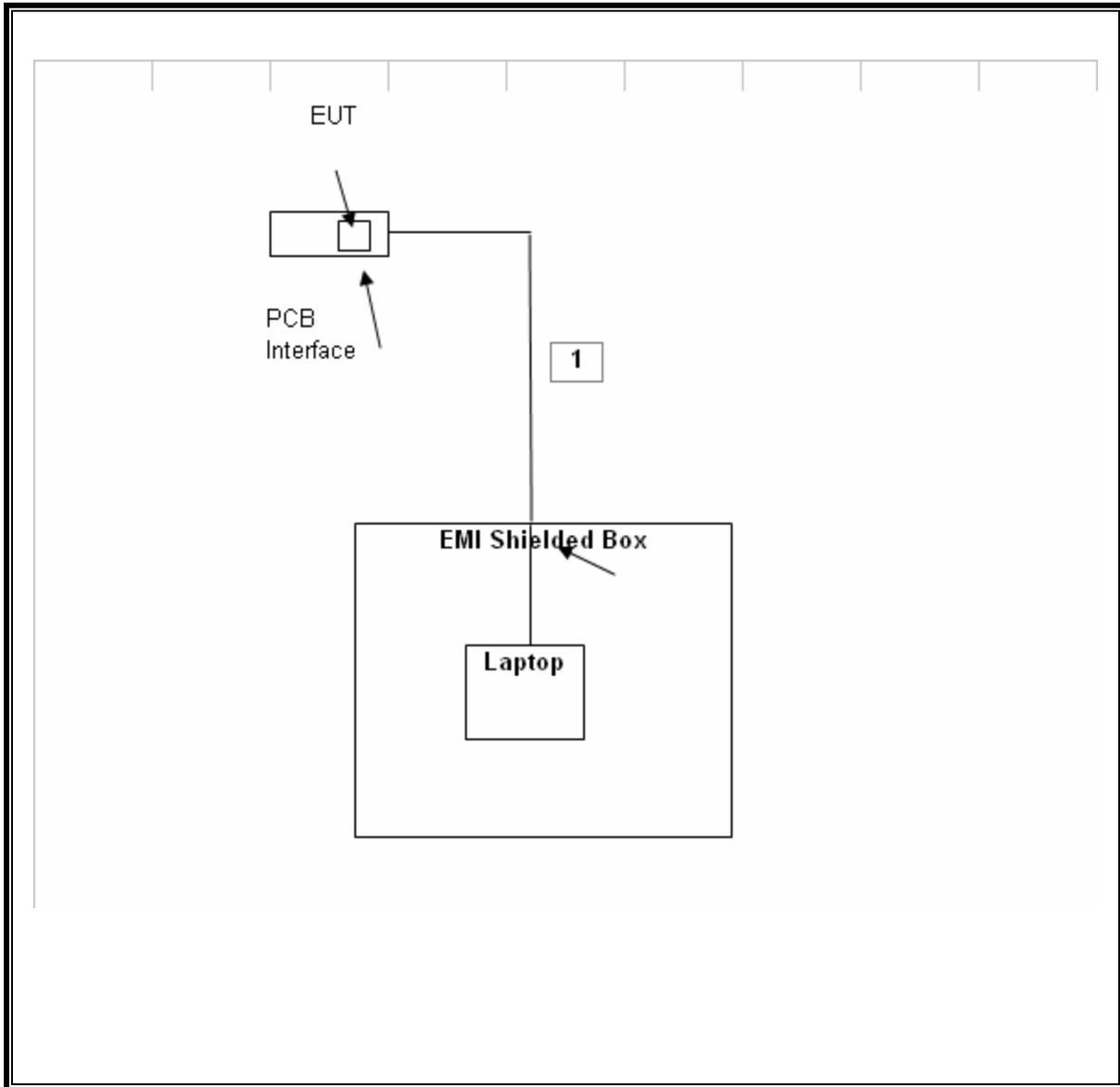
#### I/O CABLES

| I/O CABLE LIST |      |                      |                |            |              |                  |
|----------------|------|----------------------|----------------|------------|--------------|------------------|
| Cable No.      | Port | # of Identical Ports | Connector Type | Cable Type | Cable Length | Remarks          |
| 1              | USB  | 1                    | USB            | Shielded   | 2 m          | To remote Laptop |

#### TEST SETUP

For the Emissions test the EUT is on the PCB interface, connected to the remote laptop in the EMI shielded box via USB port by USB cable. Test software exercised the radio card.

**SETUP DIAGRAM FOR EMISSIONS TEST**



### 5.6.2. Line Conducted Test

#### SUPPORT EQUIPMENT

| I/O CABLE LIST |      |                      |                |            |              |                  |
|----------------|------|----------------------|----------------|------------|--------------|------------------|
| Cable No.      | Port | # of Identical Ports | Connector Type | Cable Type | Cable Length | Remarks          |
| 1              | AC   | 1                    | US115V         | Unshielded | 1m           | N/A              |
| 2              | DC   | 1                    | DC Plug in     | Unshielded | 1.5m         | N/A              |
| 3              | USB  | 1                    | USB            | Shielded   | 3 m          | To remote Laptop |

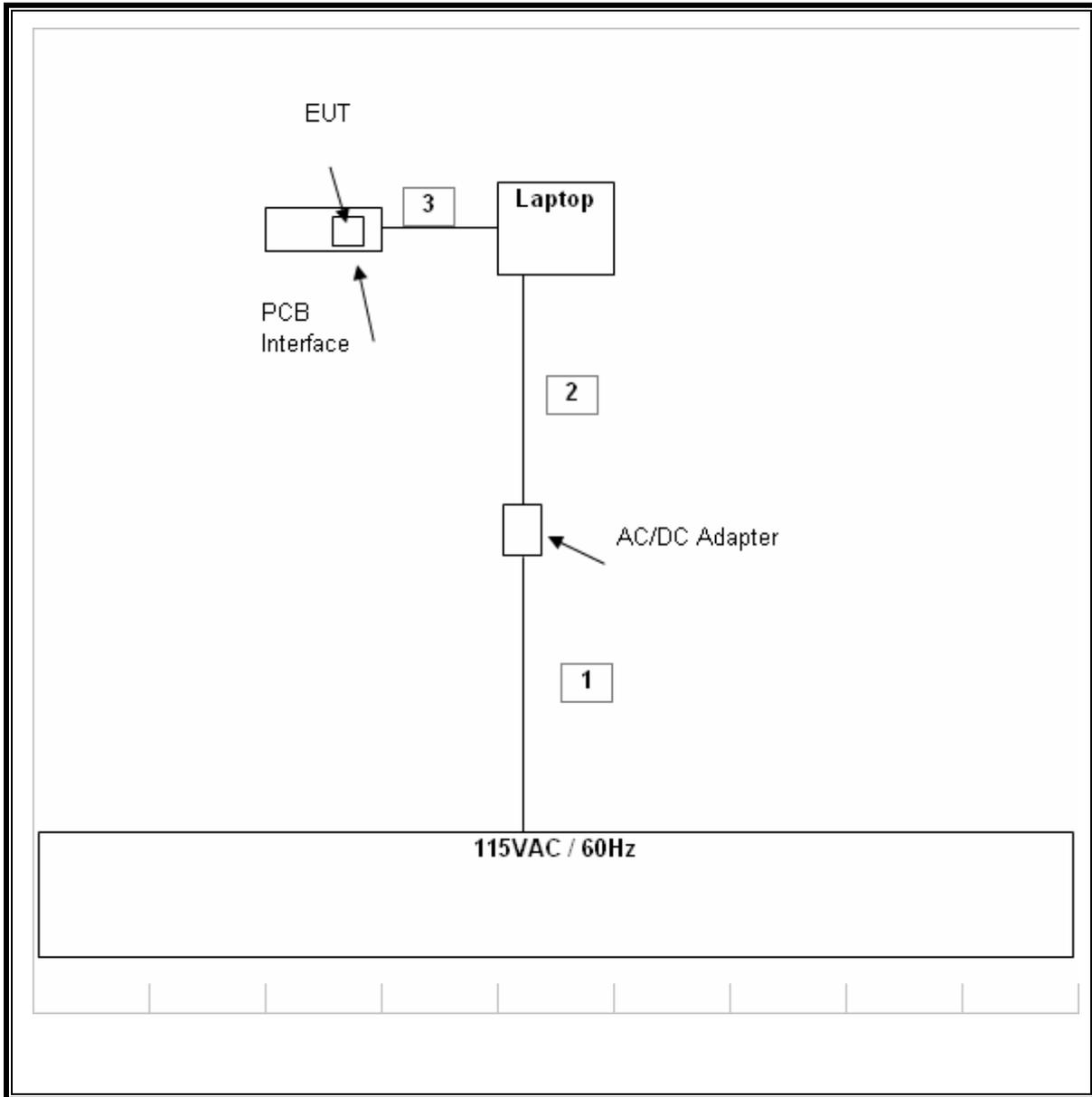
#### I/O CABLES

| I/O CABLE LIST |      |                      |                |            |              |                  |
|----------------|------|----------------------|----------------|------------|--------------|------------------|
| Cable No.      | Port | # of Identical Ports | Connector Type | Cable Type | Cable Length | Remarks          |
| 1              | AC   | 1                    | US115V         | Unshielded | 1m           | N/A              |
| 2              | DC   | 1                    | DC Plug in     | Unshielded | 1.5m         | N/A              |
| 3              | USB  | 1                    | USB            | Shielded   | .3 m         | To remote Laptop |

#### TEST SETUP

For Line conduction test the EUT inserted to the Laptop's USB port by USB cable. Test software exercised the radio card.

**SETUP DIAGRAM FOR LINE CONDUCTION TEST**



## 6. TEST AND MEASUREMENT EQUIPMENT

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

| TEST EQUIPMENT LIST         |                |                  |        |          |
|-----------------------------|----------------|------------------|--------|----------|
| Description                 | Manufacturer   | Model            | Asset  | Cal Due  |
| Preamplifier, 26.5 GHz      | Agilent / HP   | 8449B            | C00749 | 02/04/11 |
| Antenna, Bilog, 2 GHz       | Sunol Sciences | JB1              | C01171 | 01/14/11 |
| Preamplifier, 1300 MHz      | Agilent / HP   | 8447D            | C00580 | 12/16/10 |
| Spectrum Analyzer, 44 GHz   | Agilent / HP   | E4446A           | C01012 | 04/20/10 |
| Antenna, Horn, 18 GHz       | EMCO           | 3115             | C00872 | 04/22/10 |
| EMI Test Receiver, 30 MHz   | R & S          | ESHS 20          | N02396 | 05/06/11 |
| LISN, 30 MHz                | FCC            | LISN-50/250-25-2 | N02625 | 10/29/10 |
| LISN, 10 kHz ~ 30 MHz       | Solar          | 8012-50-R-24-BNC | N02481 | 10/29/10 |
| Peak Power Meter            | Boonton        | 4541             | N/A    | 01/15/11 |
| Peak / Average Power Sensor | Boonton        | 57318            | N/A    | 02/02/11 |

## 7. ANTENNA PORT TEST RESULTS

### 7.1. 802.11b MODE

#### 7.1.1. 6 dB BANDWIDTH

##### LIMITS

FCC §15.247 (a) (2)

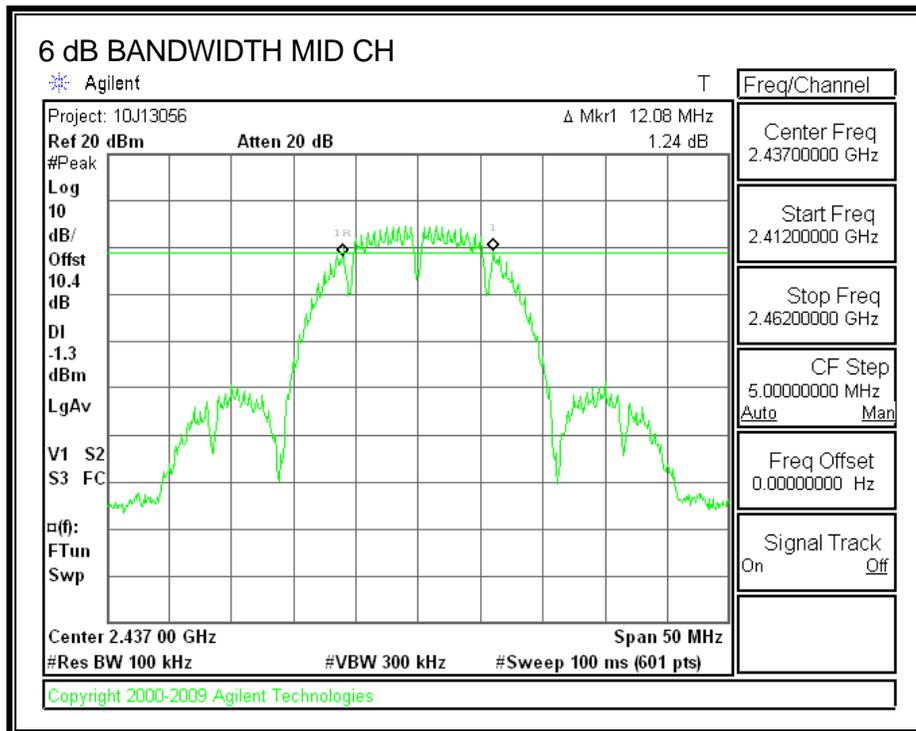
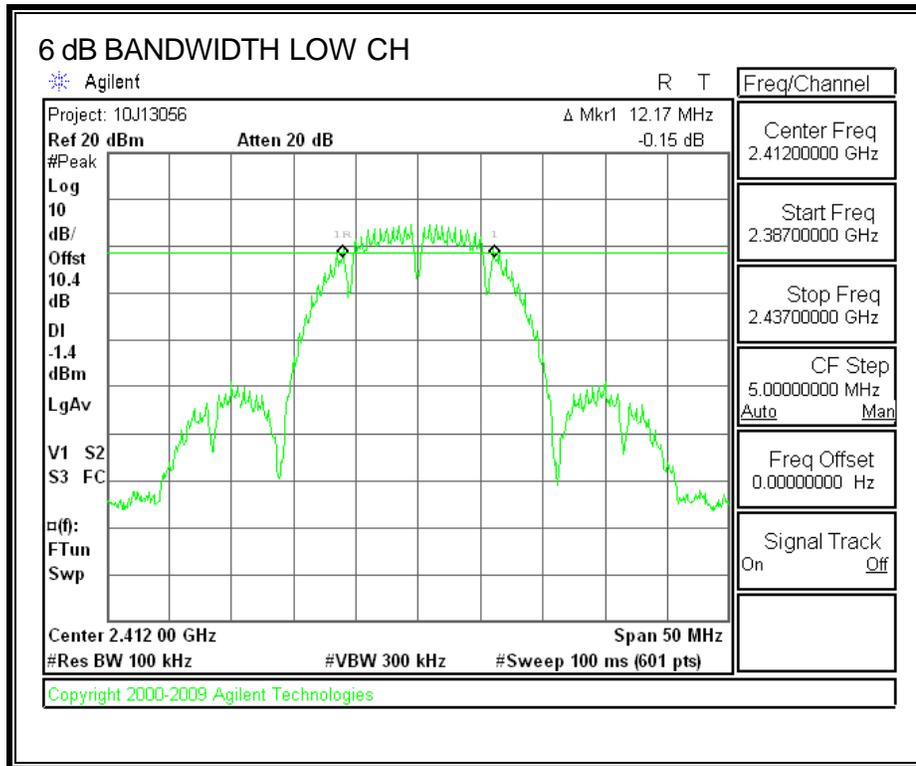
The minimum 6 dB bandwidth shall be at least 500 kHz.

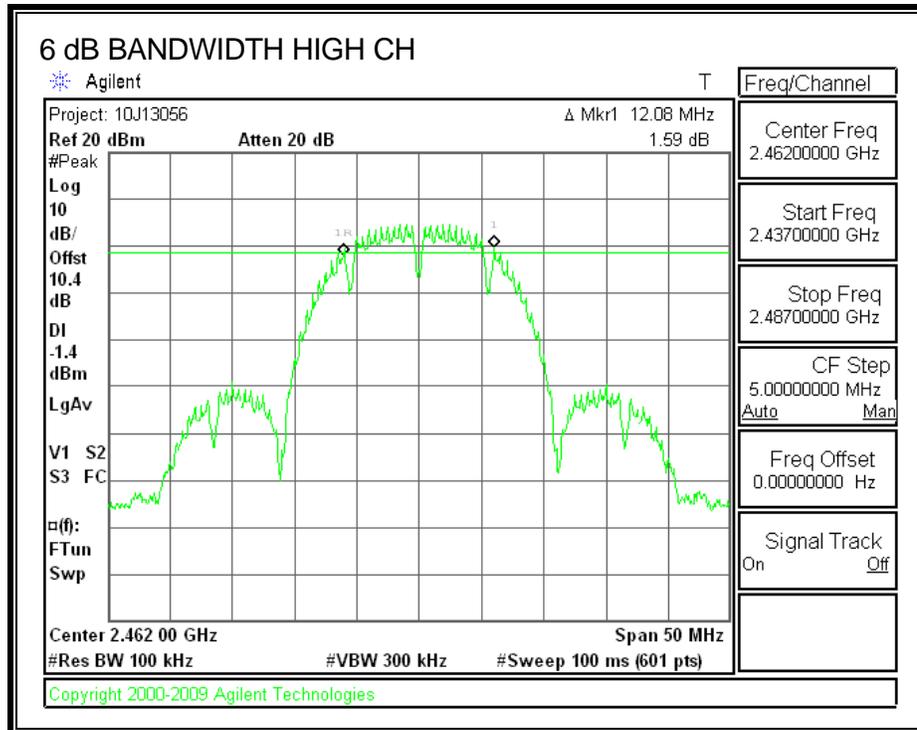
##### TEST PROCEDURE

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

##### RESULTS

| Channel | Frequency<br>(MHz) | 6 dB BW<br>(MHz) | Minimum Limit<br>(MHz) |
|---------|--------------------|------------------|------------------------|
| Low     | 2412               | 12.17            | 0.5                    |
| Middle  | 2437               | 12.08            | 0.5                    |
| High    | 2462               | 12.08            | 0.5                    |





### 7.1.2. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

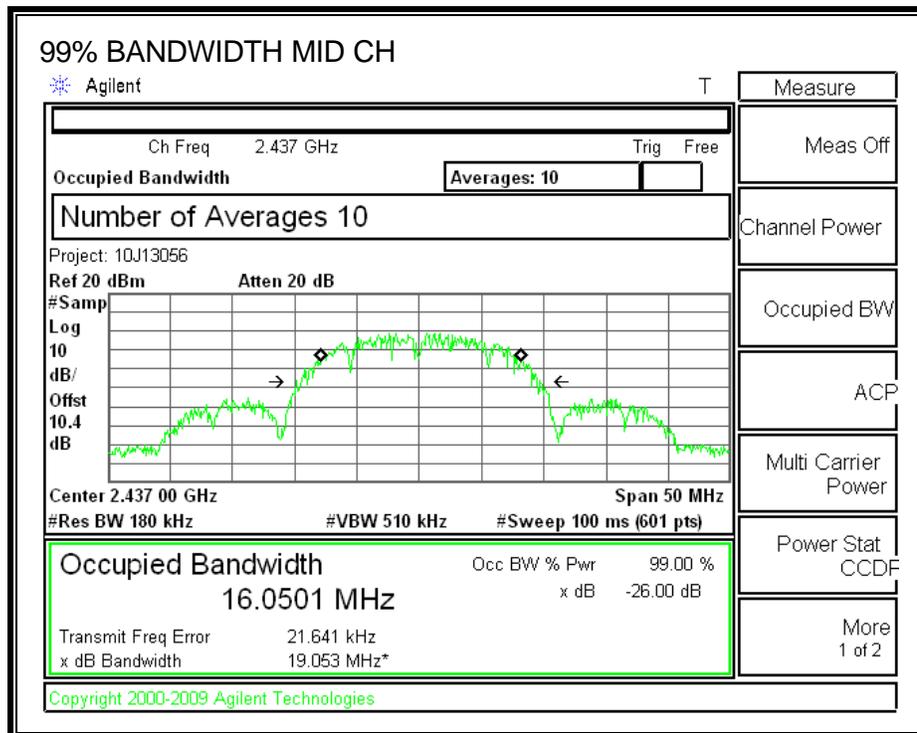
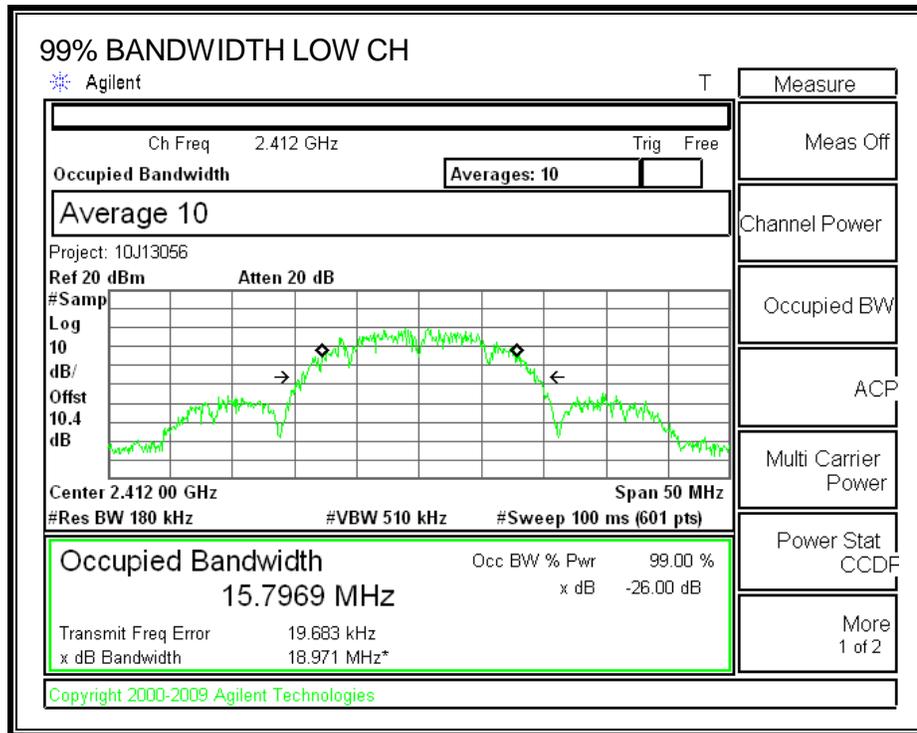
#### TEST PROCEDURE

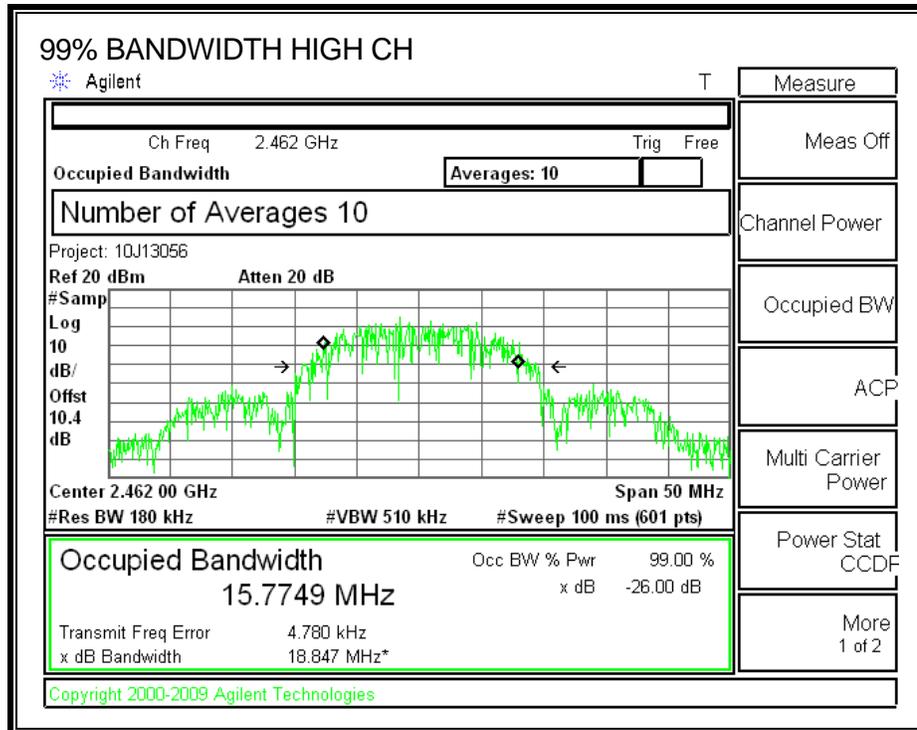
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

#### RESULTS

| Channel | Frequency<br>(MHz) | 99% Bandwidth<br>(MHz) |
|---------|--------------------|------------------------|
| Low     | 2412               | 15.7969                |
| Middle  | 2437               | 16.0501                |
| High    | 2462               | 15.7749                |

**99% BANDWIDTH**





### 7.1.3. OUTPUT POWER

#### LIMITS

FCC §15.247 (b)

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

#### TEST PROCEDURE

The transmitter output is connected to a power meter.

#### RESULTS

| Channel | Frequency<br>(MHz) | Power Meter<br>Reading<br>(dBm) | Attenuator and<br>Cable Offset<br>(dB) | Output<br>Power<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|---------------------------------|--|--------------------------|----------------|----------------|
| Low     | 2412               | 6.906                           | 10.5                                   | 17.41                    | 30             | -12.59         |
| Middle  | 2437               | 6.928                           | 10.5                                   | 17.43                    | 30             | -12.57         |
| High    | 2462               | 5.681                           | 10.5                                   | 16.18                    | 30             | -13.82         |

#### 7.1.4. AVERAGE POWER

##### LIMITS

None; for reporting purposes only.

##### TEST PROCEDURE

The transmitter output is connected to a power meter.

##### RESULTS

| Channel | Frequency<br>(MHz) | Power Meter<br>Reading<br>(dBm) | Attenuator and<br>Cable Offset<br>(dB) | Output<br>Power<br>(dBm) |
|---------|--------------------|---------------------------------|--|--------------------------|
| Low     | 2412               | 4.58                            | 10.5                                   | 15.08                    |
| Middle  | 2437               | 4.67                            | 10.5                                   | 15.17                    |
| High    | 2462               | 3.19                            | 10.5                                   | 13.69                    |

### 7.1.5. POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.247 (e)

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

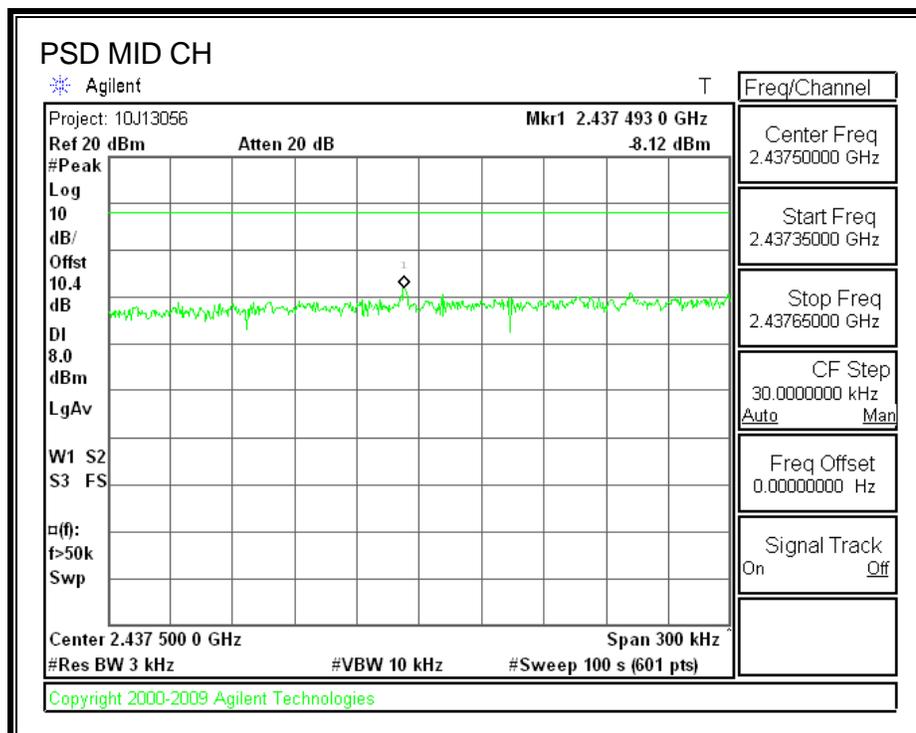
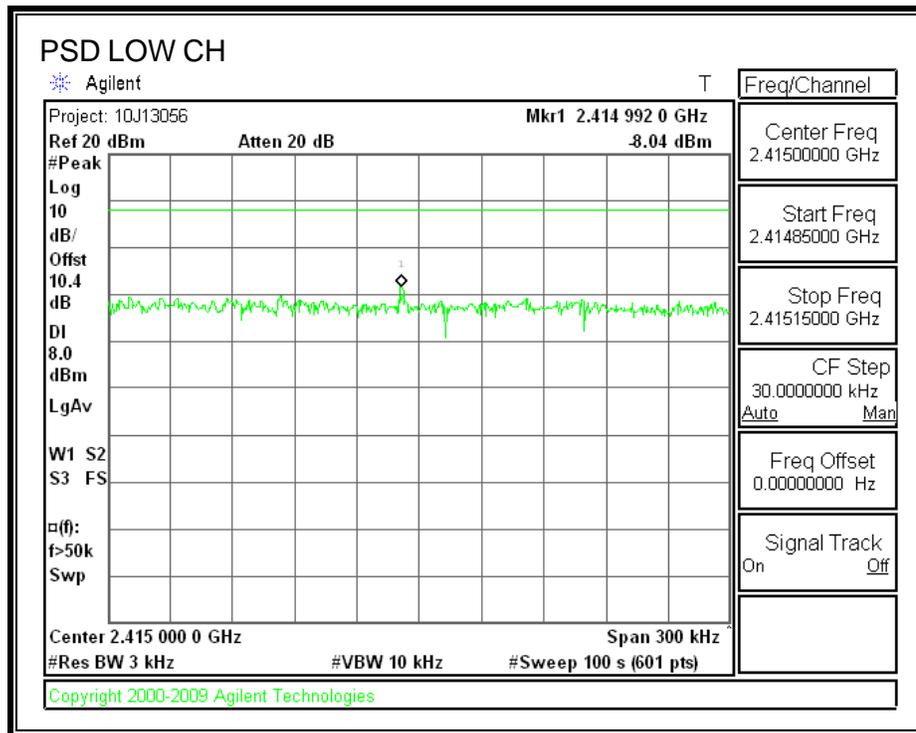
#### TEST PROCEDURE

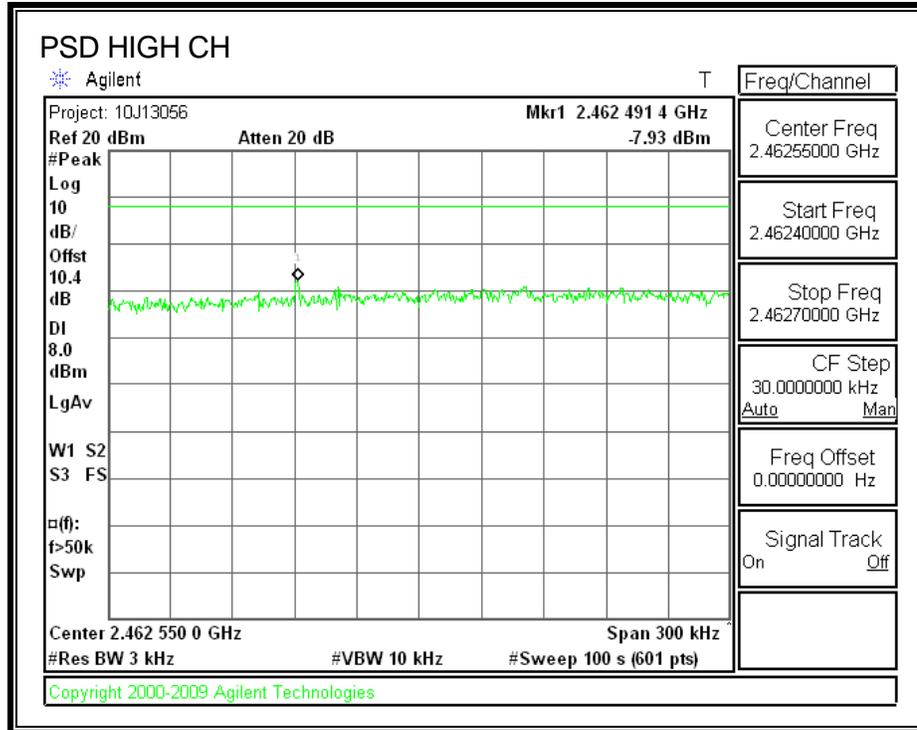
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

#### RESULTS

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Margin (dB) |
|---------|-----------------|------------|-------------|-------------|
| Low     | 2412            | -8.04      | 8           | -16.04      |
| Middle  | 2437            | -8.12      | 8           | -16.12      |
| High    | 2462            | -7.93      | 8           | -15.93      |

**POWER SPECTRAL DENSITY**





## 7.1.6. CONDUCTED SPURIOUS EMISSIONS

### LIMITS

FCC §15.247 (d)

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

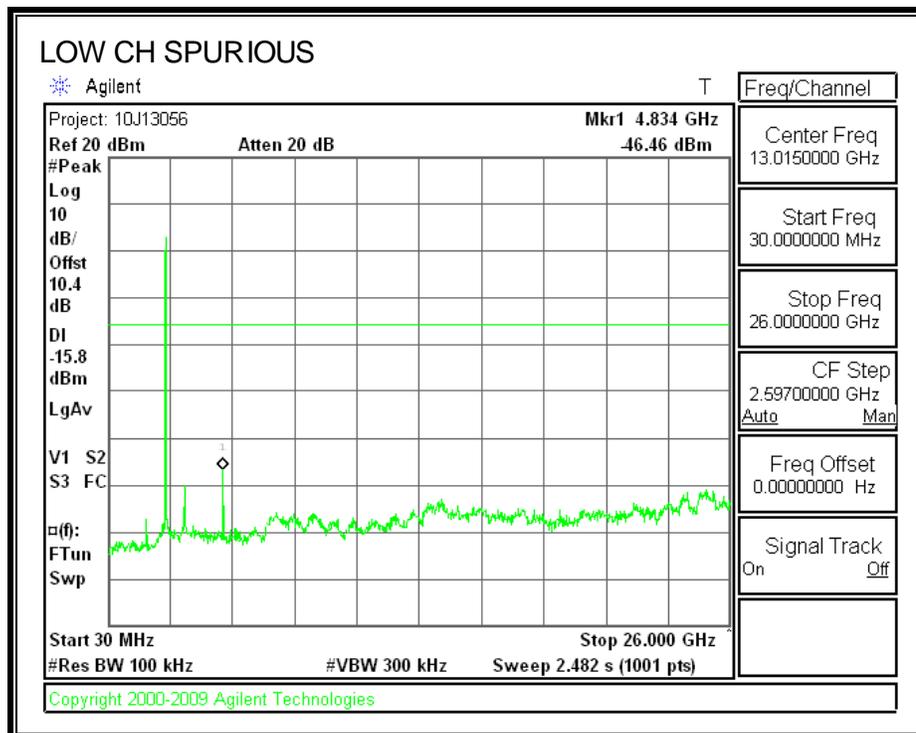
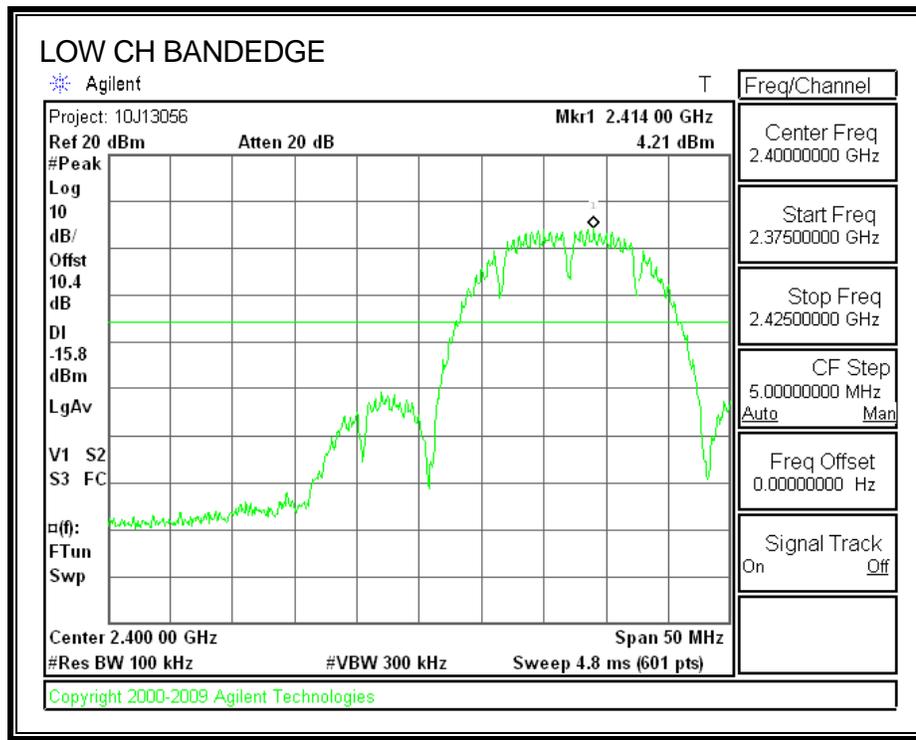
### TEST PROCEDURE

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

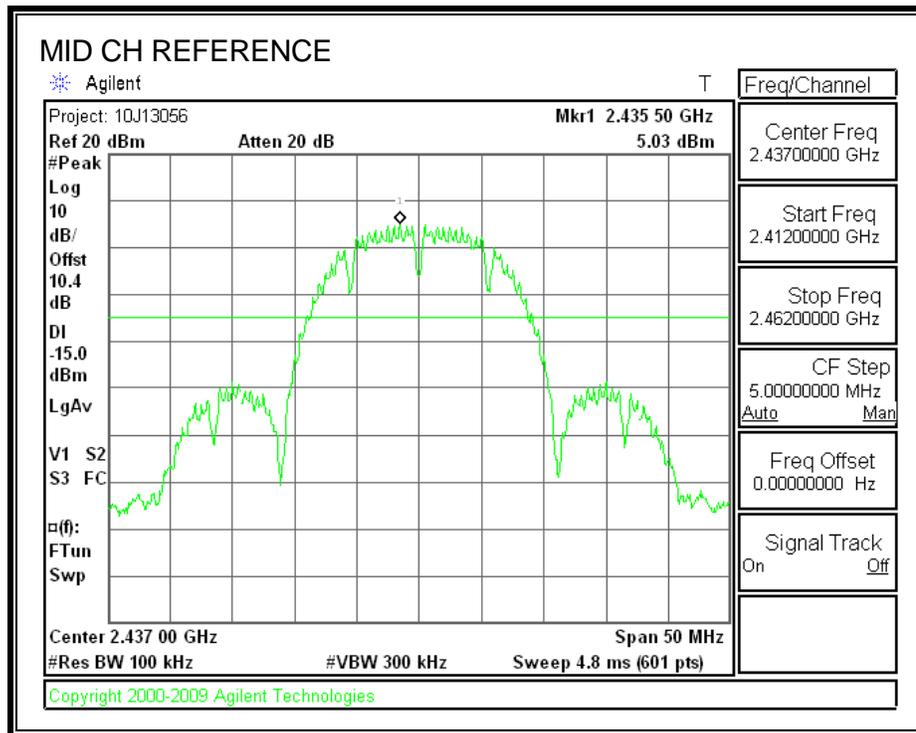
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

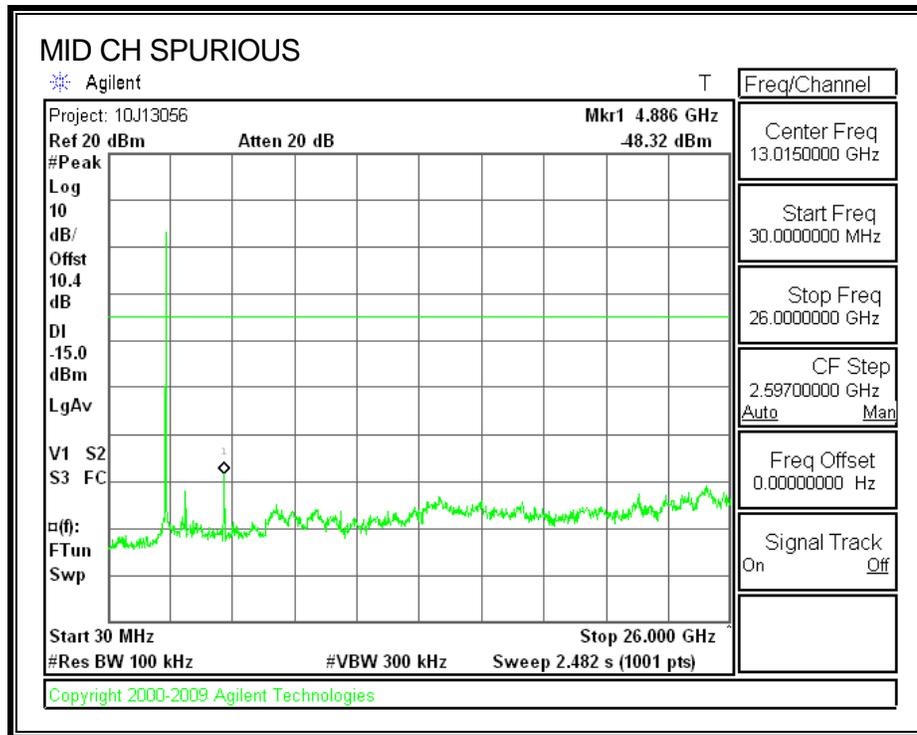
**RESULTS**

**SPURIOUS EMISSIONS, LOW CHANNEL**

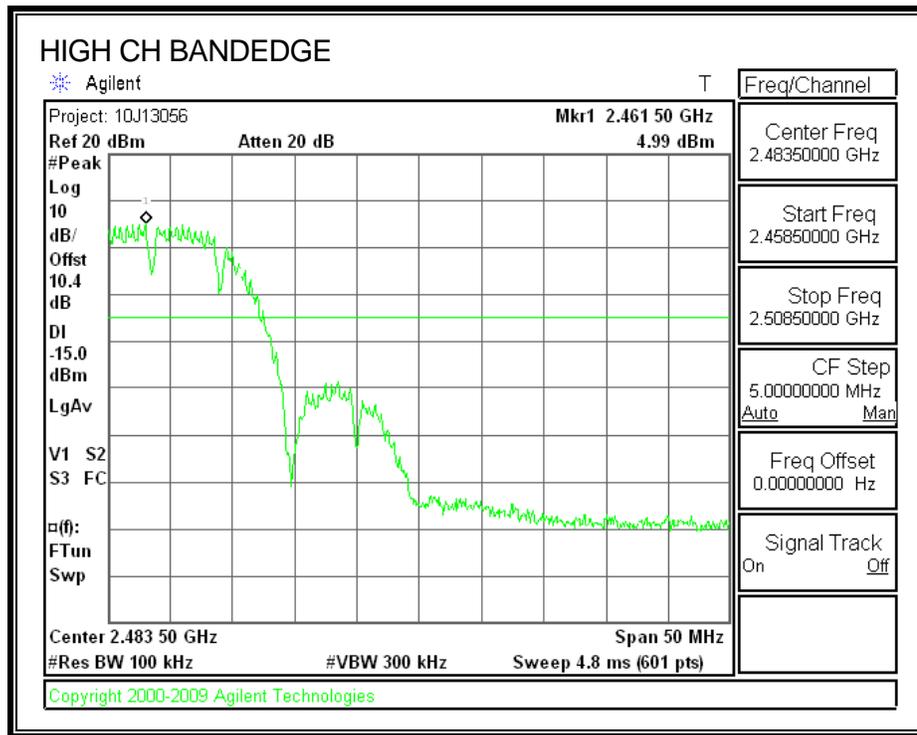


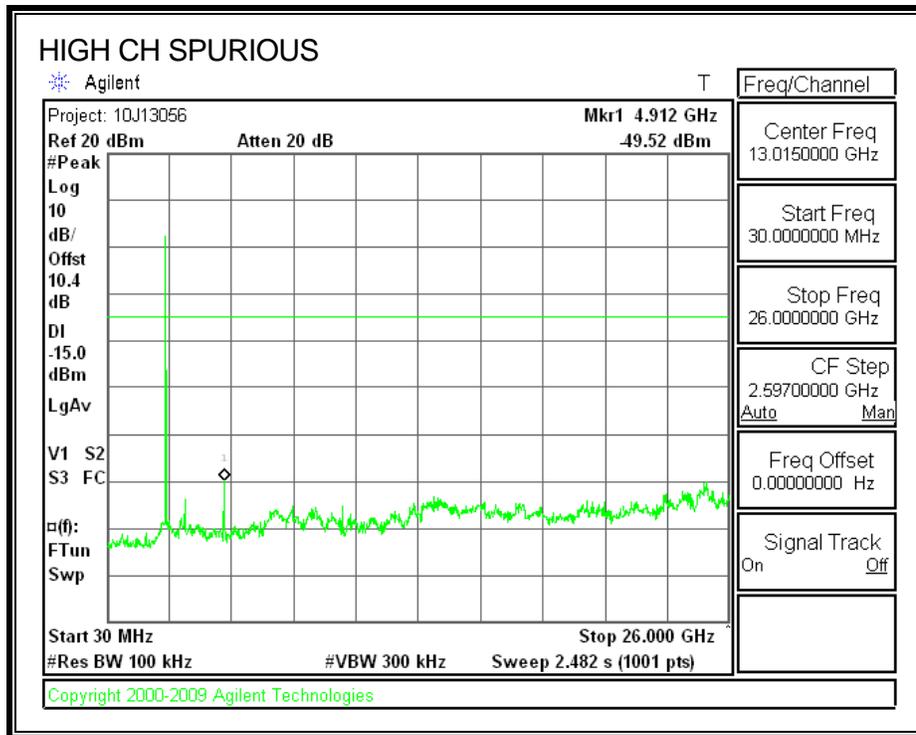
**SPURIOUS EMISSIONS, MID CHANNEL**





**SPURIOUS EMISSIONS, HIGH CHANNEL**





## 7.2. 802.11 g MODE IN THE 2.4 GHz BAND

### 7.2.1. 6 dB BANDWIDTH

#### LIMITS

FCC §15.247 (a) (2)

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

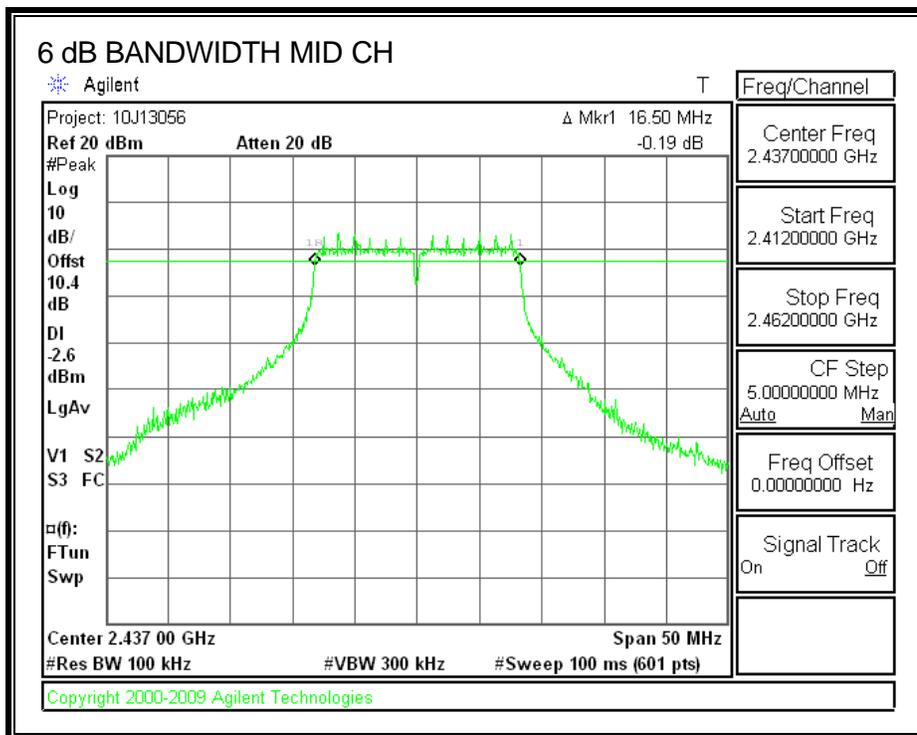
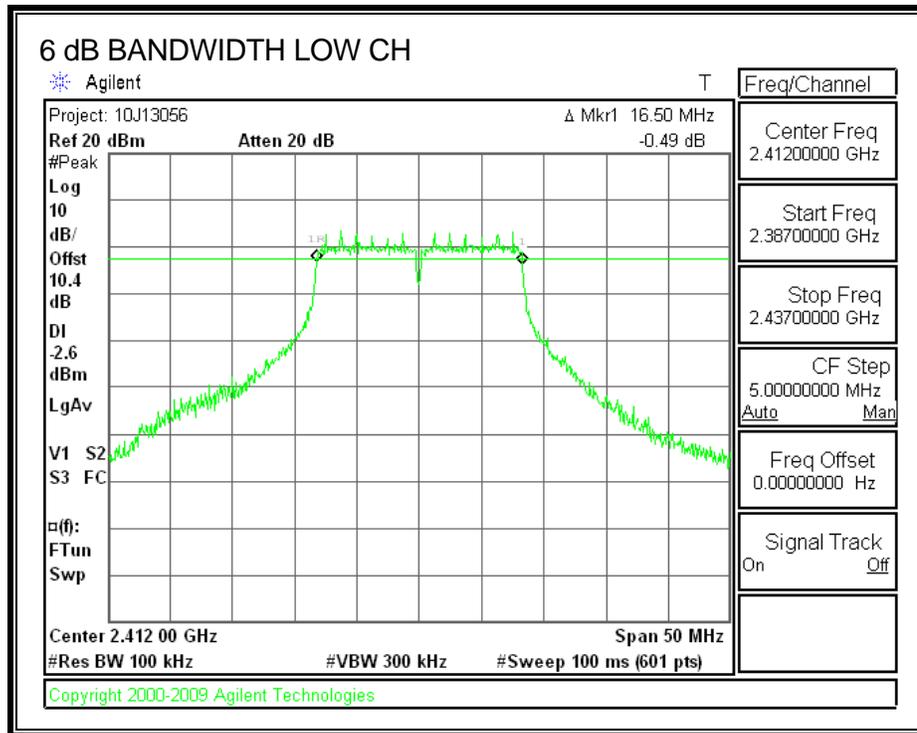
#### TEST PROCEDURE

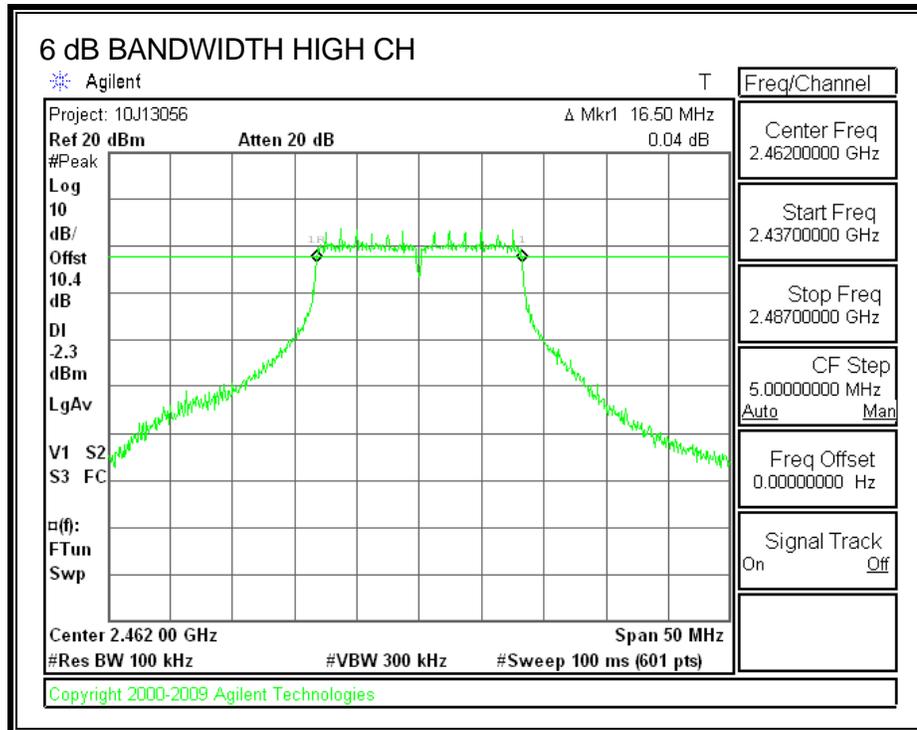
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

#### RESULTS

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---------|-----------------|----------------------|---------------------|
| Low     | 2412            | 16.5                 | 0.5                 |
| Middle  | 2437            | 16.5                 | 0.5                 |
| High    | 2462            | 16.5                 | 0.5                 |

**6 dB BANDWIDTH**





## 7.2.2. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

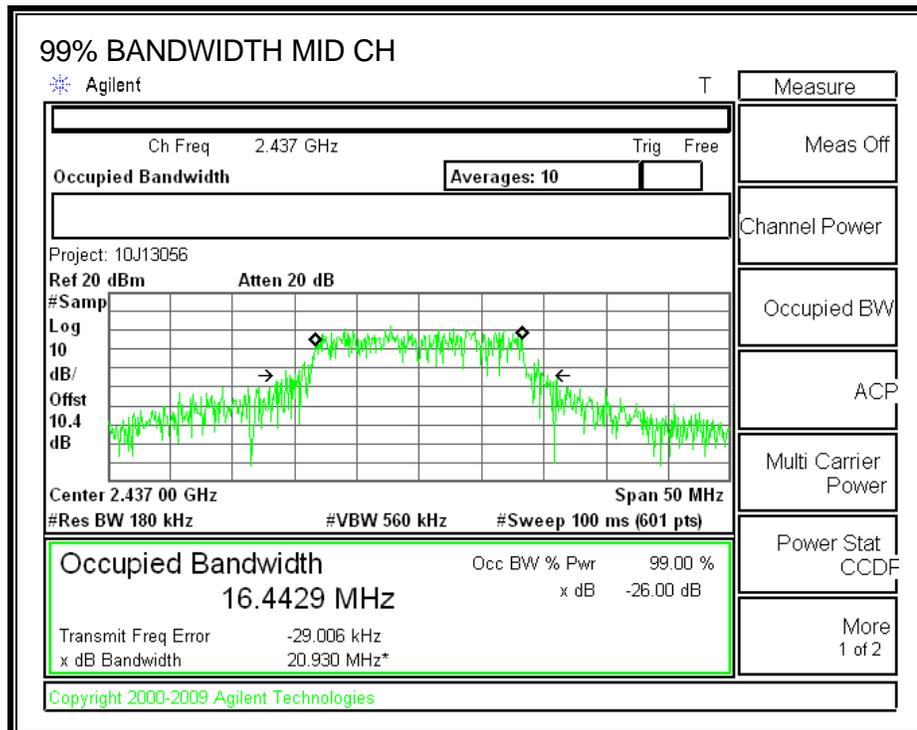
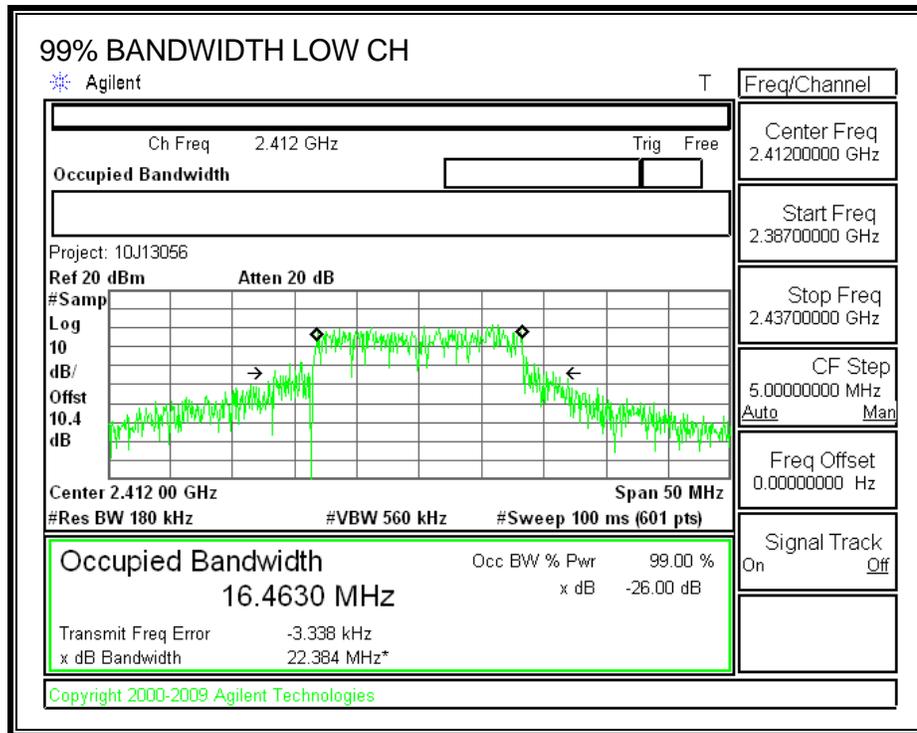
### TEST PROCEDURE

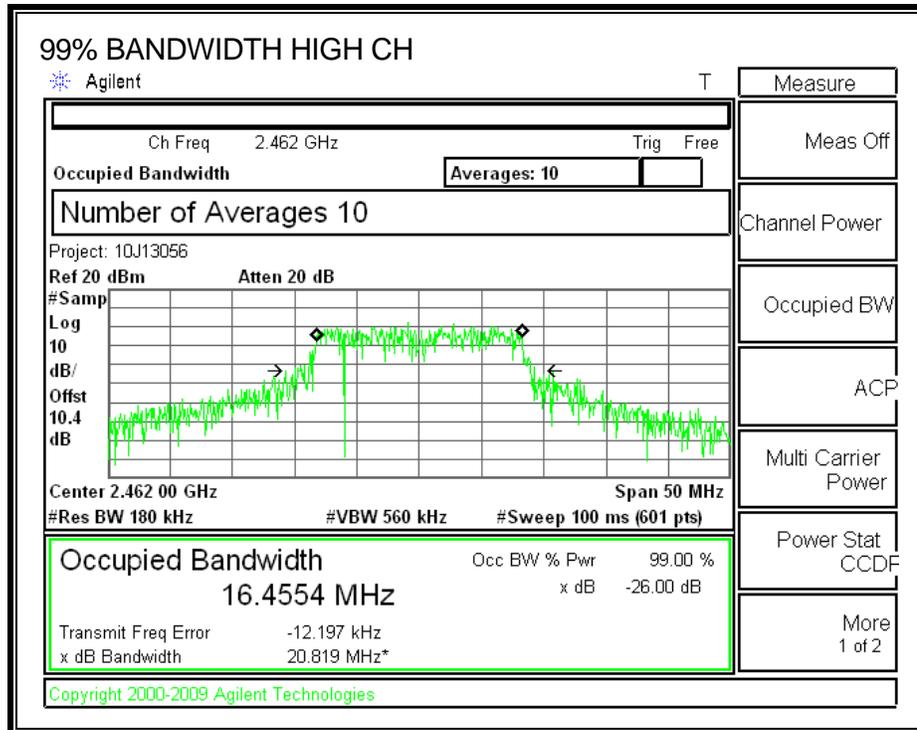
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

### RESULTS

| Channel | Frequency<br>(MHz) | 99% Bandwidth<br>(MHz) |
|---------|--------------------|------------------------|
| Low     | 2412               | 16.463                 |
| Middle  | 2437               | 16.443                 |
| High    | 2462               | 16.455                 |

**99% BANDWIDTH**





### 7.2.3. OUTPUT POWER

#### LIMITS

FCC §15.247 (b)

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

#### TEST PROCEDURE

The transmitter output is connected to a power meter.

#### RESULTS

| Channel | Frequency<br>(MHz) | Power Meter<br>Reading<br>(dBm) | Attenuator and<br>Cable Offset<br>(dB) | Output<br>Power<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|---------------------------------|--|--------------------------|----------------|----------------|
| Low     | 2412               | 8.516                           | 10.5                                   | 19.02                    | 30             | -10.98         |
| Middle  | 2437               | 11.867                          | 10.5                                   | 22.37                    | 30             | -7.63          |
| High    | 2462               | 11.827                          | 10.5                                   | 22.33                    | 30             | -7.67          |

## 7.2.4. AVERAGE POWER

### LIMITS

None; for reporting purposes only.

### TEST PROCEDURE

The transmitter output is connected to a power meter.

### RESULTS

| Channel | Frequency<br>(MHz) | Power Meter<br>Reading<br>(dBm) | Attenuator and<br>Cable Offset<br>(dB) | Output<br>Power<br>(dBm) |
|---------|--------------------|---------------------------------|--|--------------------------|
| Low     | 2412               | 1.372                           | 10.5                                   | 11.87                    |
| Middle  | 2437               | 4.578                           | 10.5                                   | 15.08                    |
| High    | 2462               | 4.501                           | 10.5                                   | 15.00                    |

## 7.2.5. POWER SPECTRAL DENSITY

### LIMITS

FCC §15.247 (e)

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

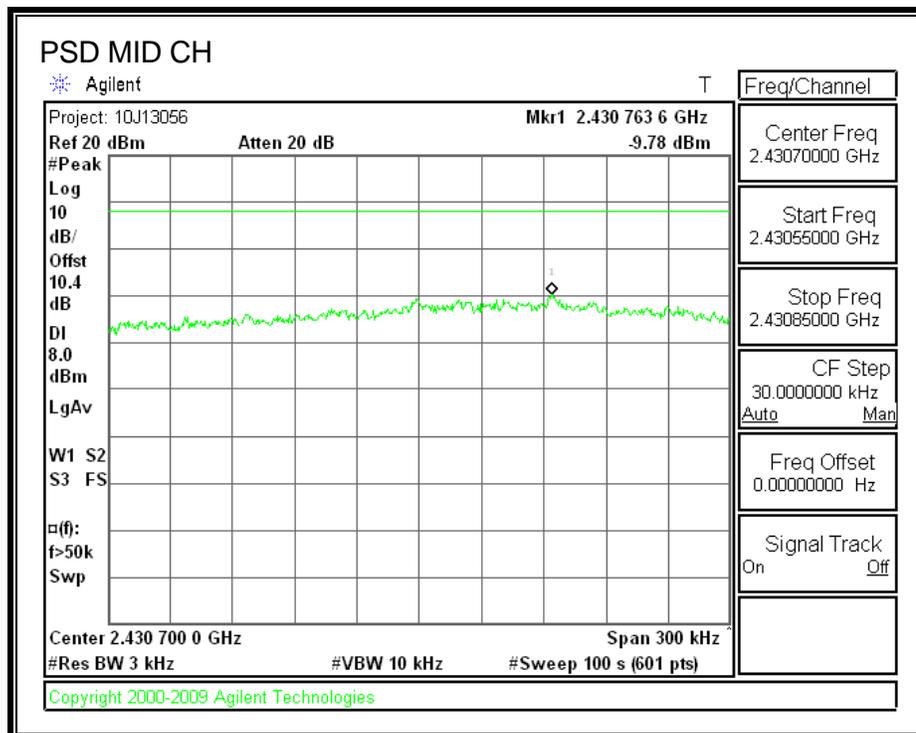
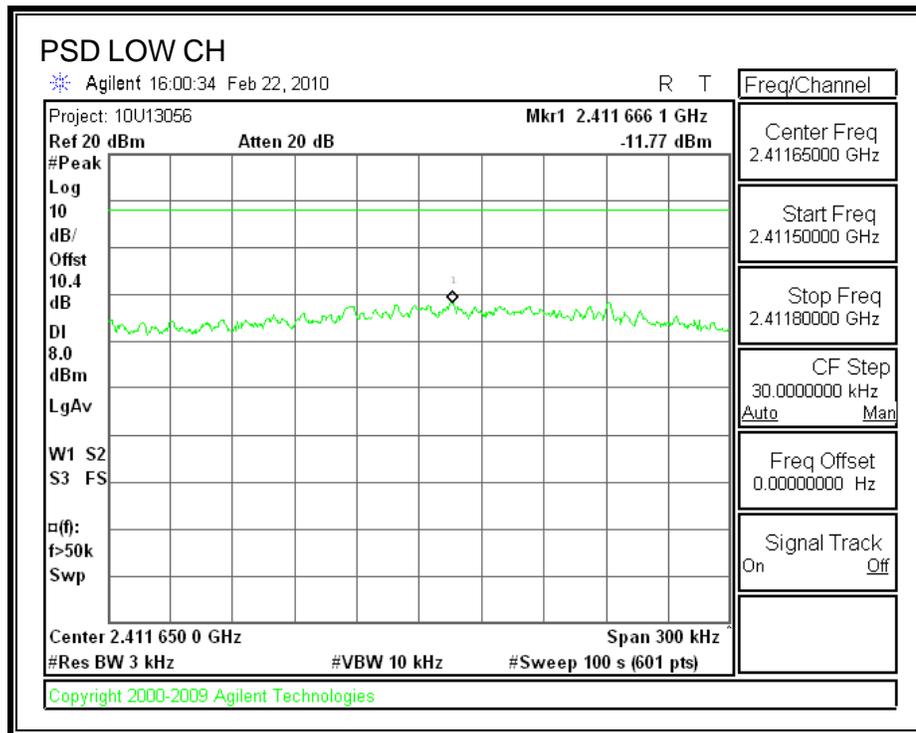
### TEST PROCEDURE

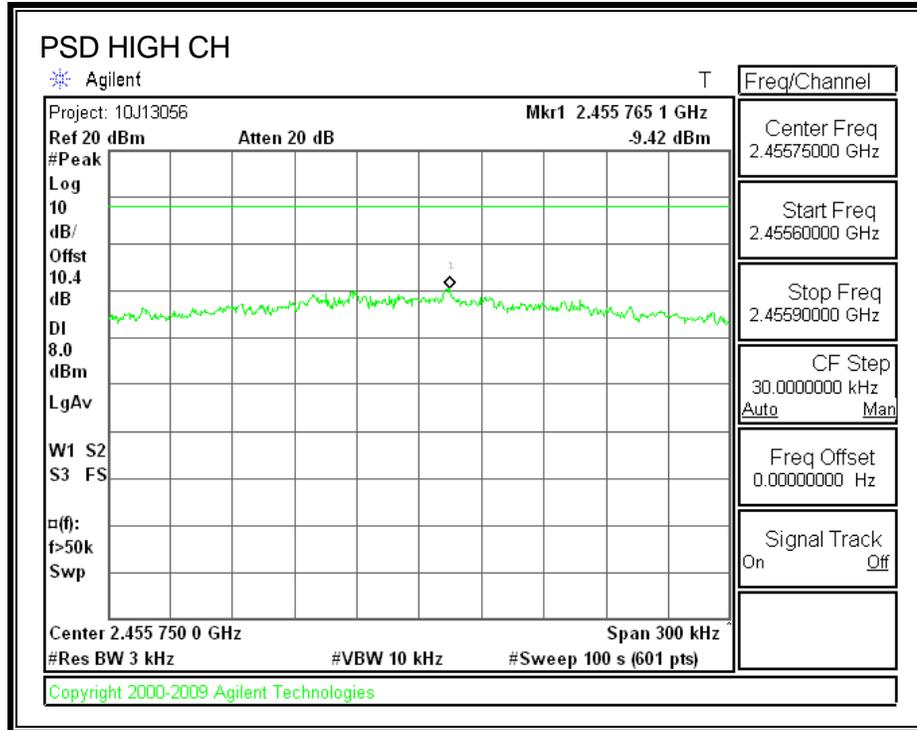
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

### RESULTS

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Margin (dB) |
|---------|-----------------|------------|-------------|-------------|
| Low     | 2412            | -11.77     | 8           | -19.77      |
| Middle  | 2437            | -9.78      | 8           | -17.78      |
| High    | 2462            | -9.42      | 8           | -17.42      |

**POWER SPECTRAL DENSITY**





## **7.2.6. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

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

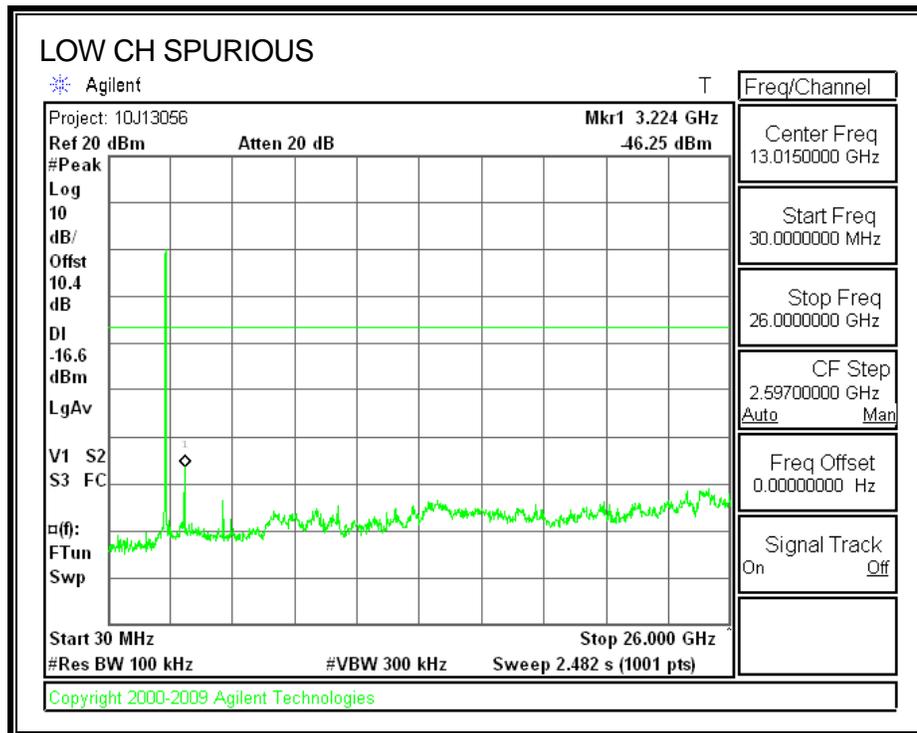
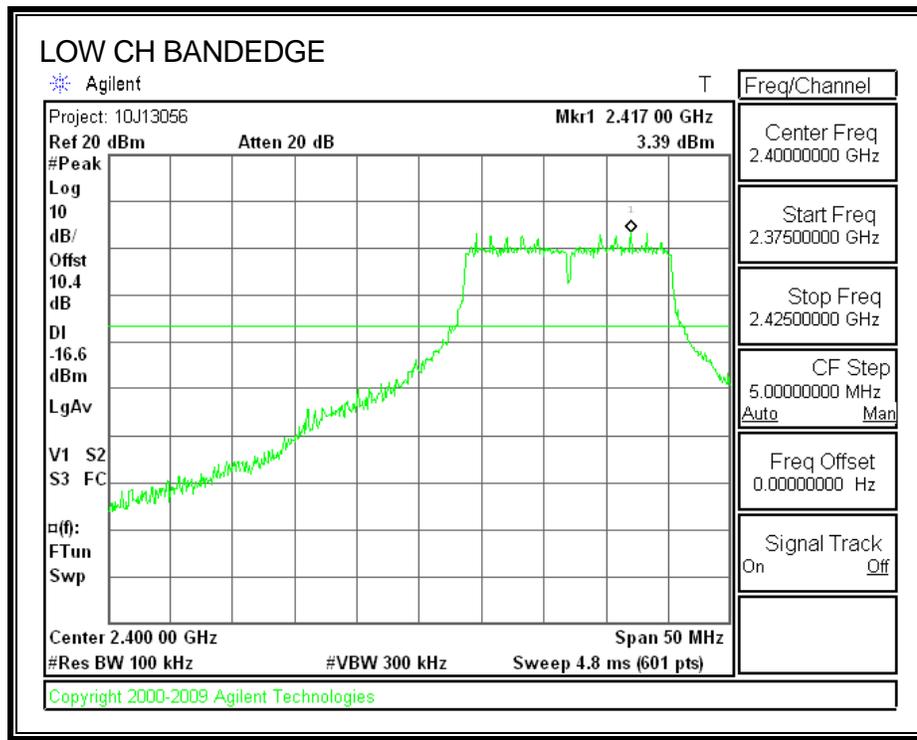
### **TEST PROCEDURE**

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

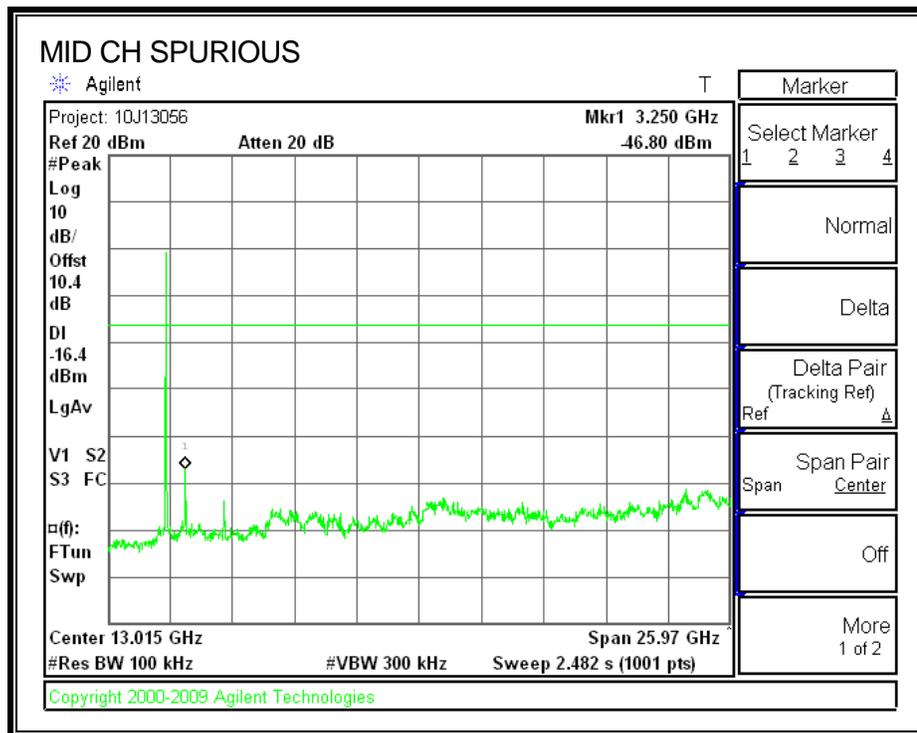
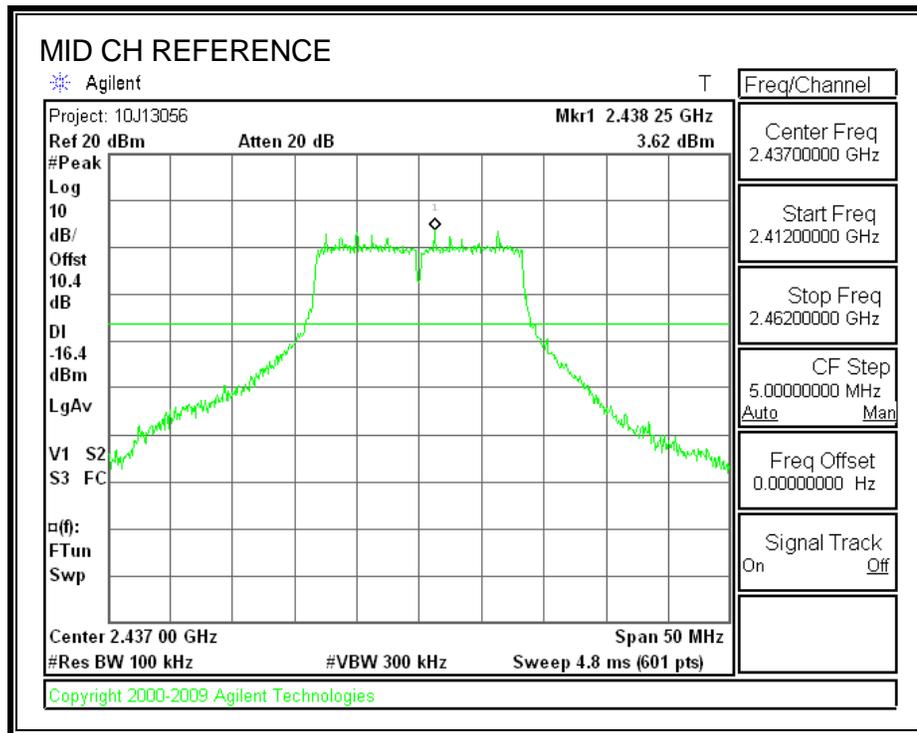
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

**RESULTS**

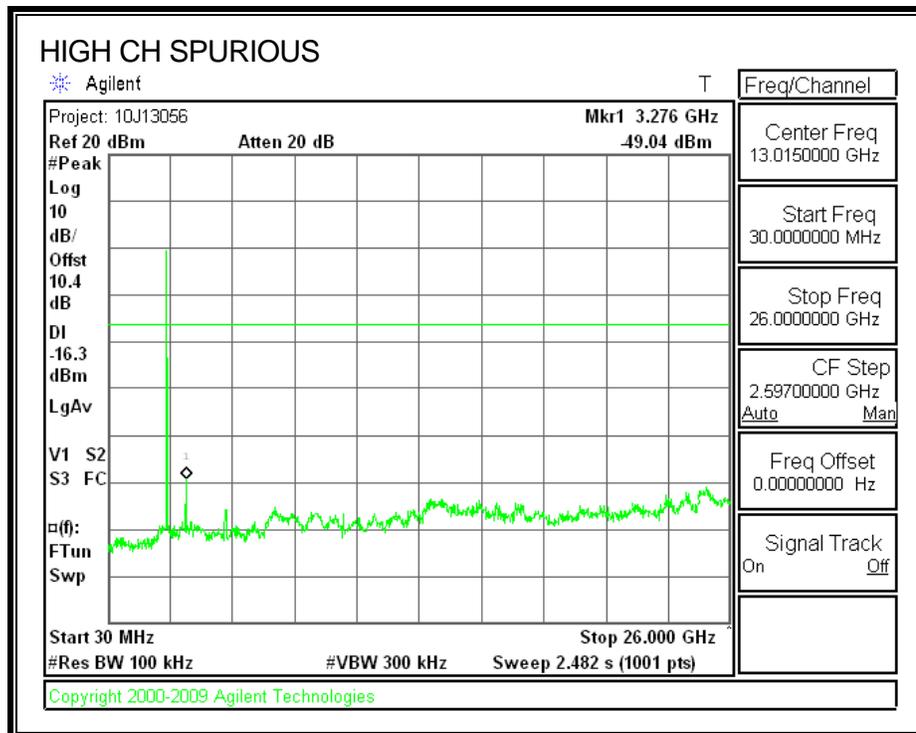
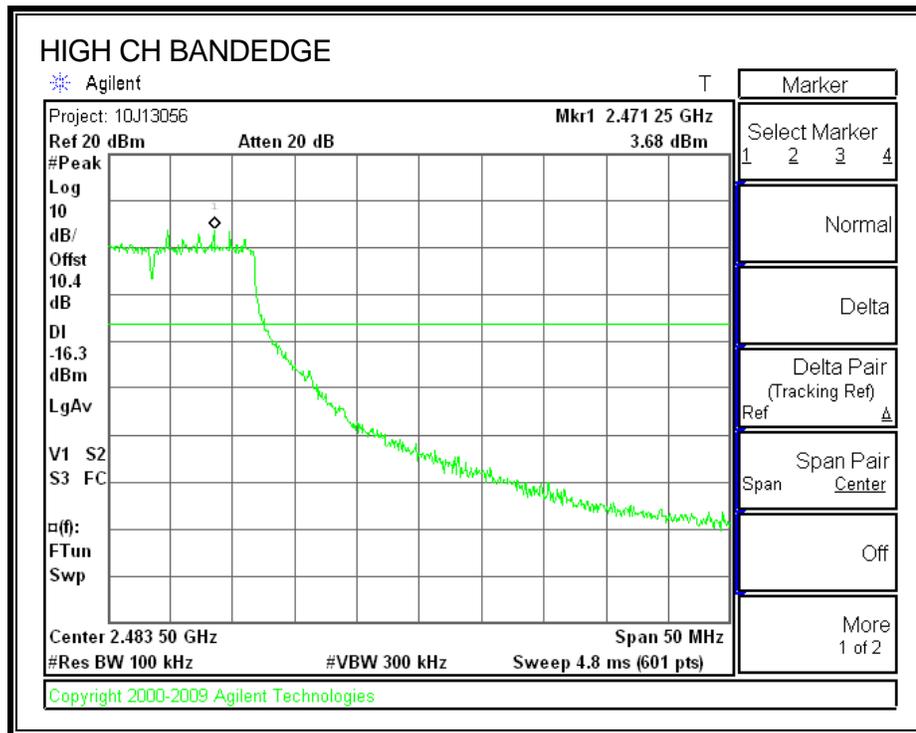
**SPURIOUS EMISSIONS, LOW CHANNEL**



**SPURIOUS EMISSIONS, MID CHANNEL**



**SPURIOUS EMISSIONS, HIGH CHANNEL**



### 7.3. 802.11HT 20 MODE IN THE 2.4 GHz BAND

#### 7.3.1. 6 dB BANDWIDTH

##### LIMITS

FCC §15.247 (a) (2)

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

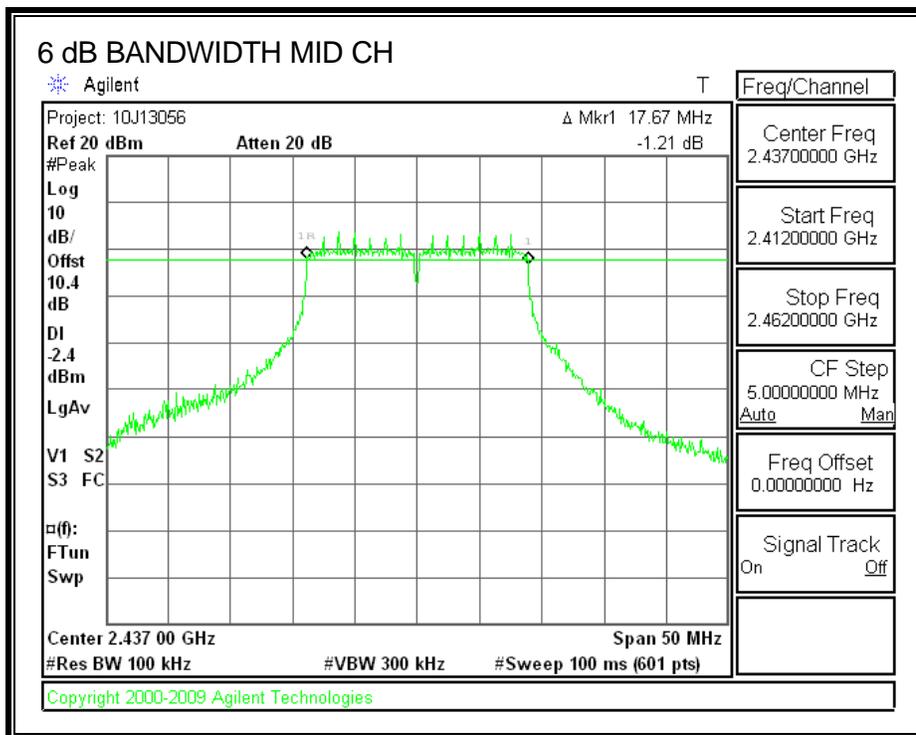
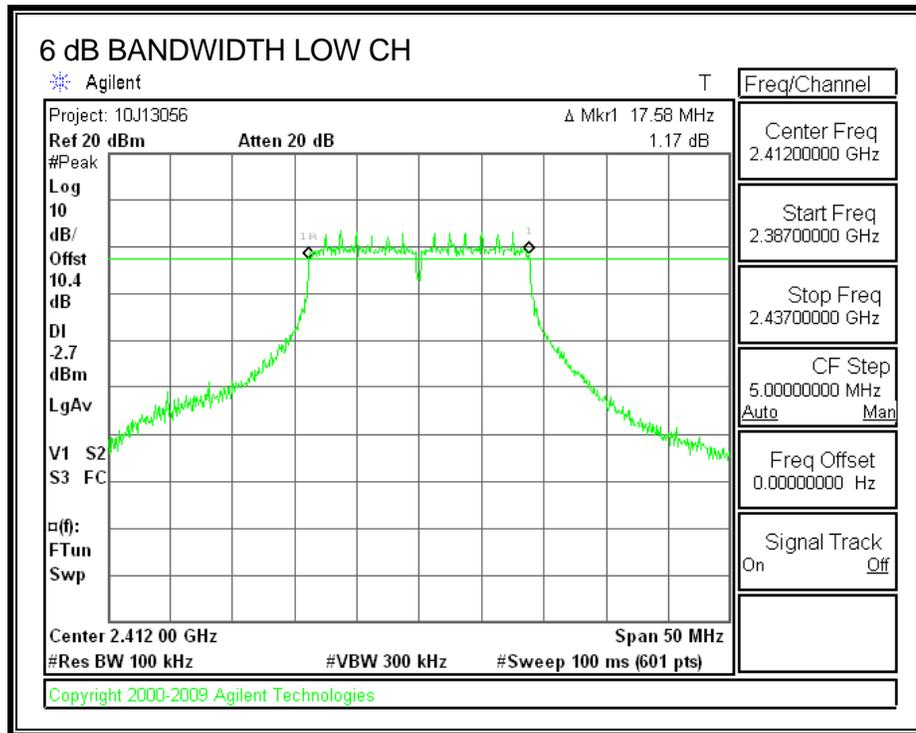
##### TEST PROCEDURE

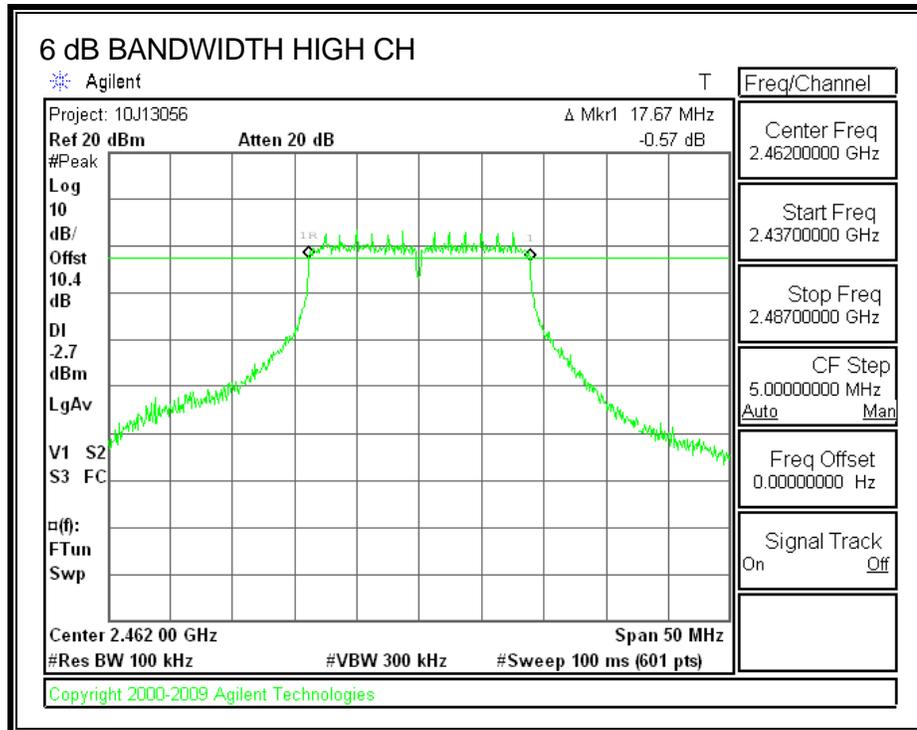
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

##### RESULTS

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---------|-----------------|----------------------|---------------------|
| Low     | 2412            | 17.58                | 0.5                 |
| Middle  | 2437            | 17.67                | 0.5                 |
| High    | 2462            | 17.67                | 0.5                 |

**6 dB BANDWIDTH**





### 7.3.2. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

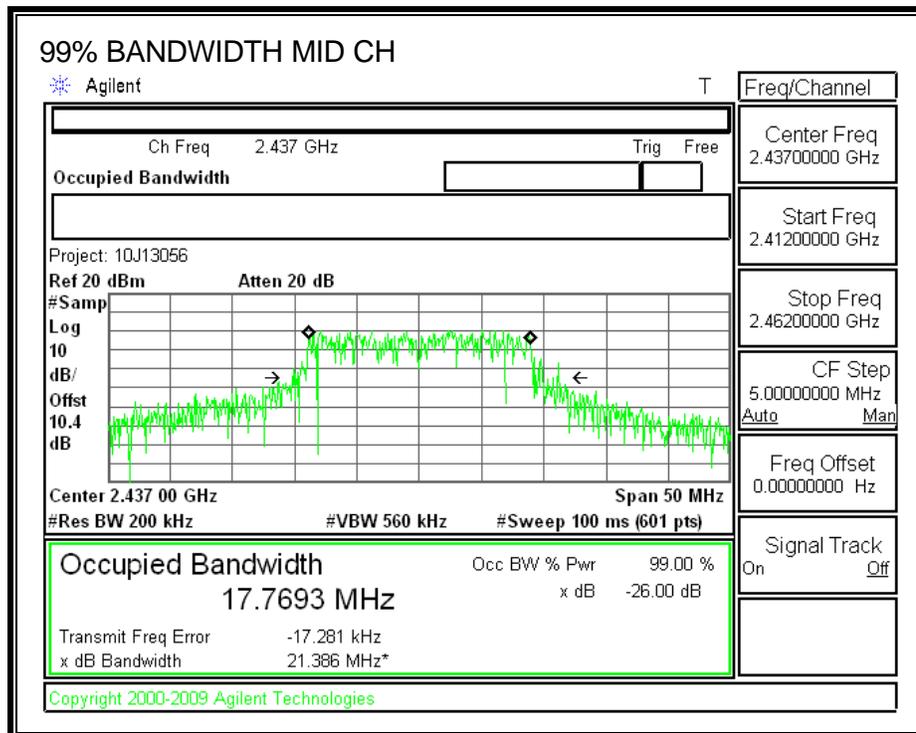
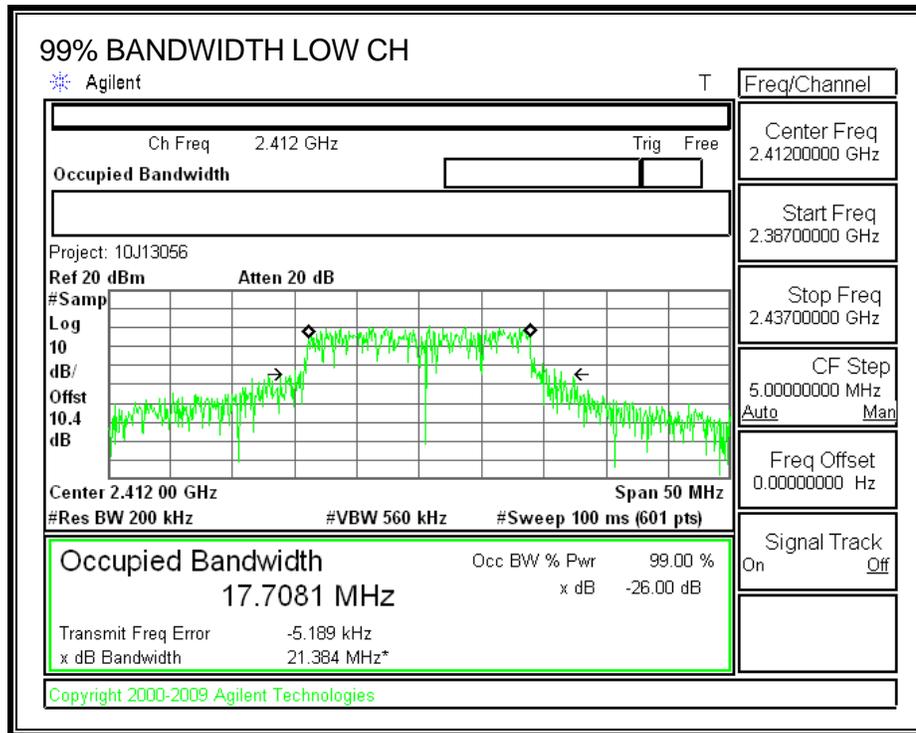
#### TEST PROCEDURE

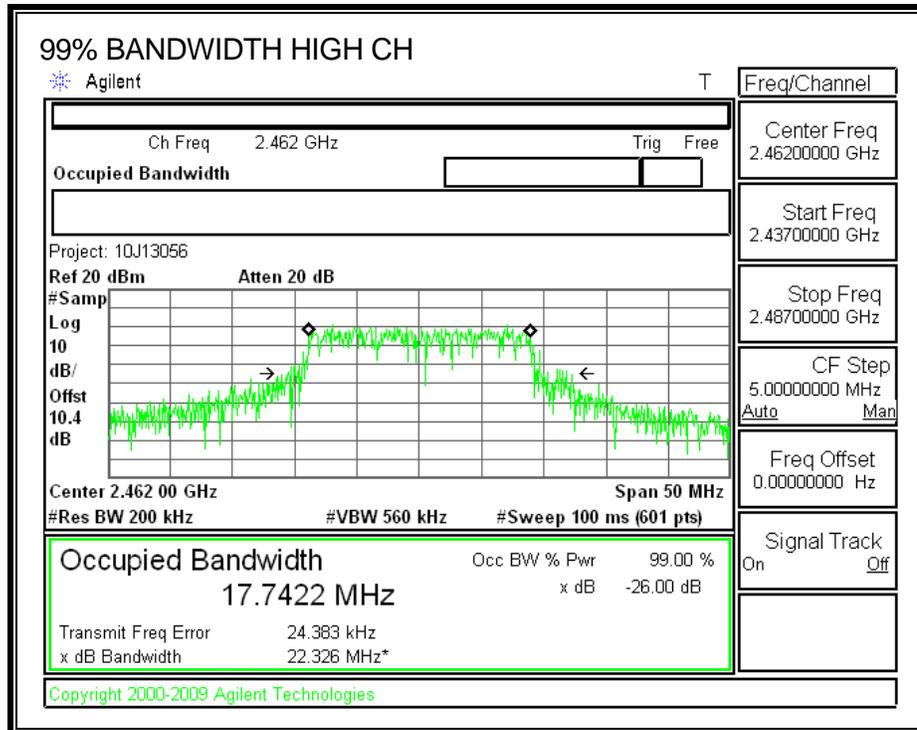
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

#### RESULTS

| Channel | Frequency<br>(MHz) | 99% Bandwidth<br>(MHz) |
|---------|--------------------|------------------------|
| Low     | 2412               | 17.708                 |
| Middle  | 2437               | 17.769                 |
| High    | 2462               | 17.742                 |

**99% BANDWIDTH**





### 7.3.3. OUTPUT POWER

#### LIMITS

FCC §15.247 (b)

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

#### TEST PROCEDURE

The transmitter output is connected to a power meter.

#### RESULTS

| Channel | Frequency<br>(MHz) | Power Meter<br>Reading<br>(dBm) | Attenuator and<br>Cable Offset<br>(dB) | Output<br>Power<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|---------------------------------|--|--------------------------|----------------|----------------|
| Low     | 2412               | 8.82                            | 10.5                                   | 19.32                    | 30             | -10.68         |
| Middle  | 2437               | 13.14                           | 10.5                                   | 23.64                    | 30             | -6.36          |
| High    | 2462               | 11.00                           | 10.5                                   | 21.50                    | 30             | -8.50          |

### 7.3.4. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter output is connected to a power meter.

#### RESULTS

| Channel | Frequency<br>(MHz) | Power Meter<br>Reading<br>(dBm) | Attenuator and<br>Cable Offset<br>(dB) | Output<br>Power<br>(dBm) |
|---------|--------------------|---------------------------------|--|--------------------------|
| Low     | 2412               | 0.647                           | 10.5                                   | 11.15                    |
| Middle  | 2437               | 4.542                           | 10.5                                   | 15.04                    |
| High    | 2462               | 3.446                           | 10.5                                   | 13.95                    |

### 7.3.5. POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.247 (e)

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

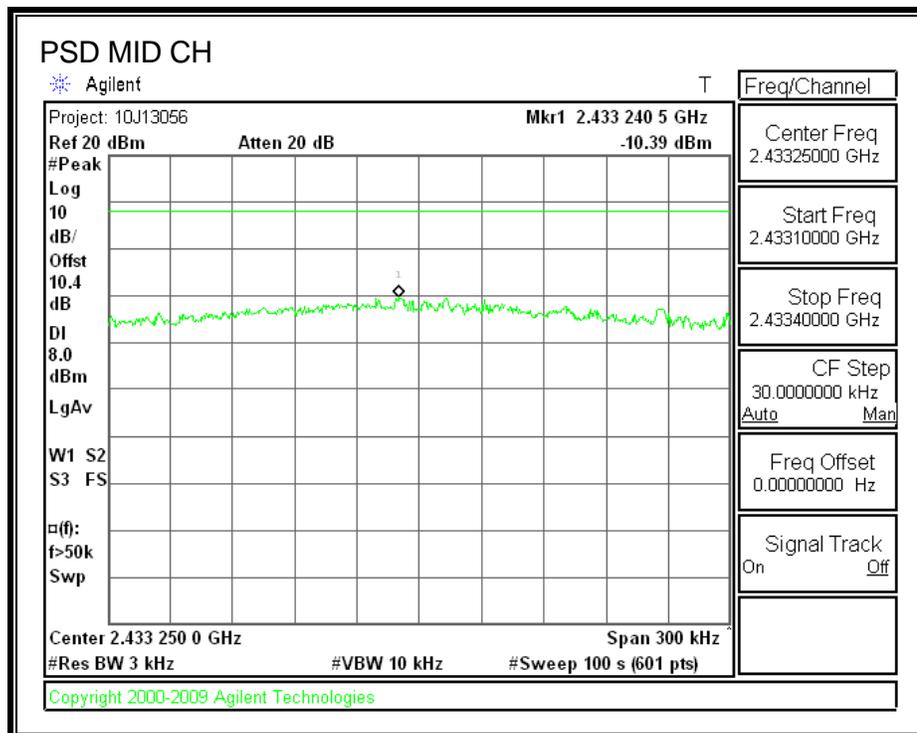
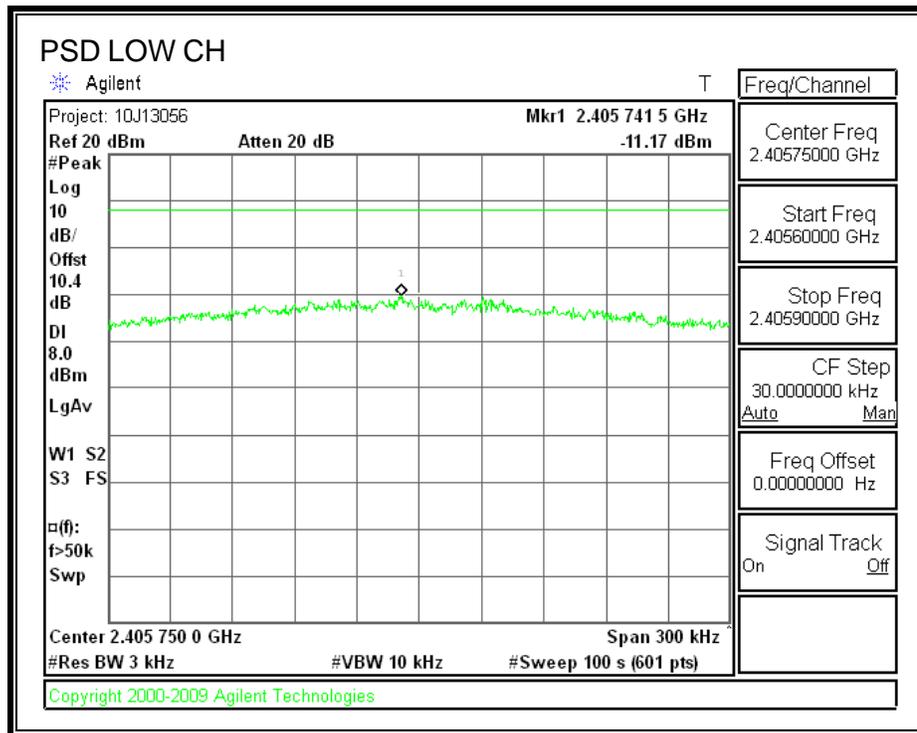
#### TEST PROCEDURE

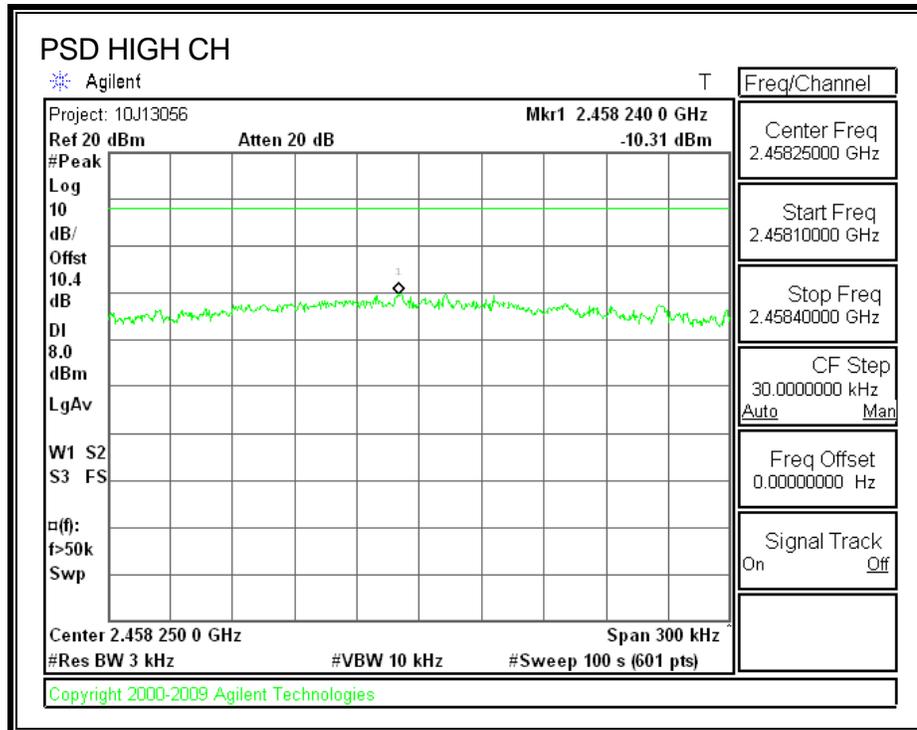
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

#### RESULTS

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Margin (dB) |
|---------|-----------------|------------|-------------|-------------|
| Low     | 2412            | -11.17     | 8           | -19.17      |
| Middle  | 2437            | -10.39     | 8           | -18.39      |
| High    | 2462            | -10.31     | 8           | -18.31      |

**POWER SPECTRAL DENSITY**





### **7.3.6. CONDUCTED SPURIOUS EMISSIONS**

#### **LIMITS**

FCC §15.247 (d)

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

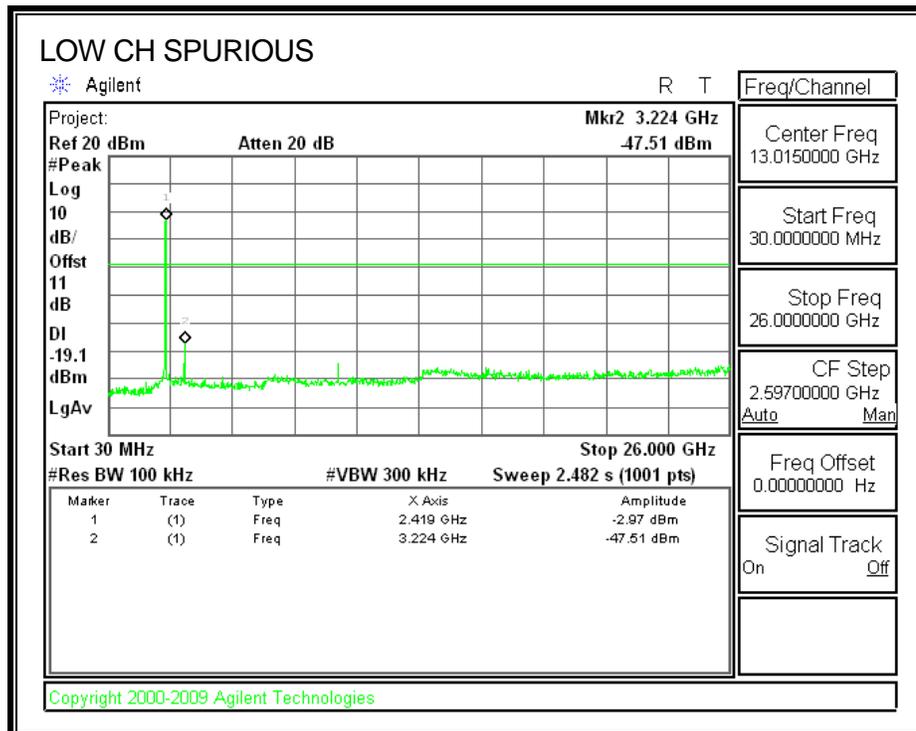
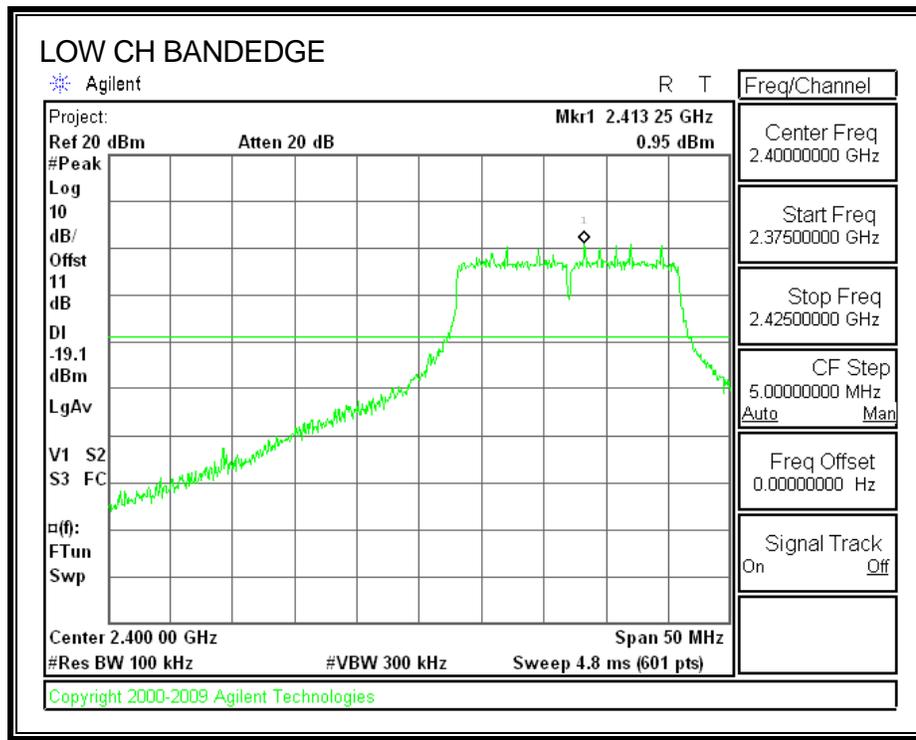
#### **TEST PROCEDURE**

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

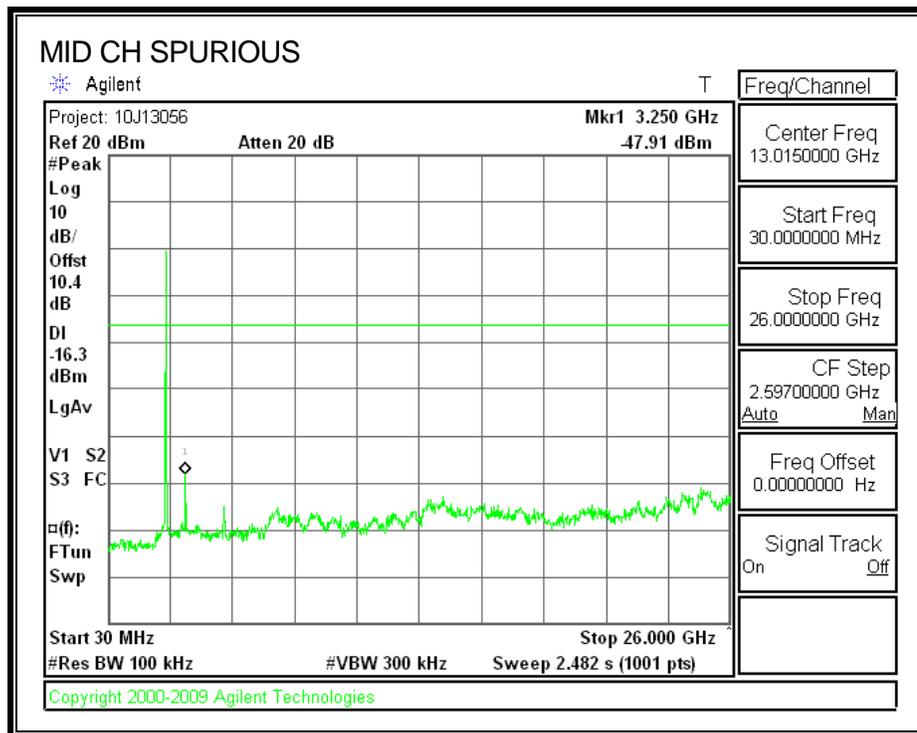
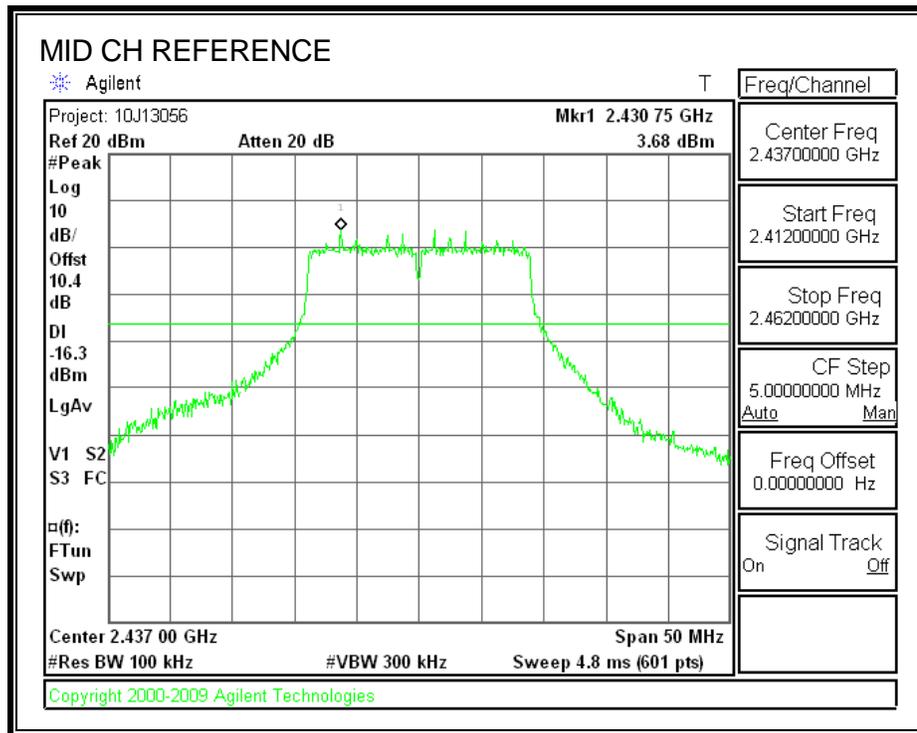
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

**RESULTS**

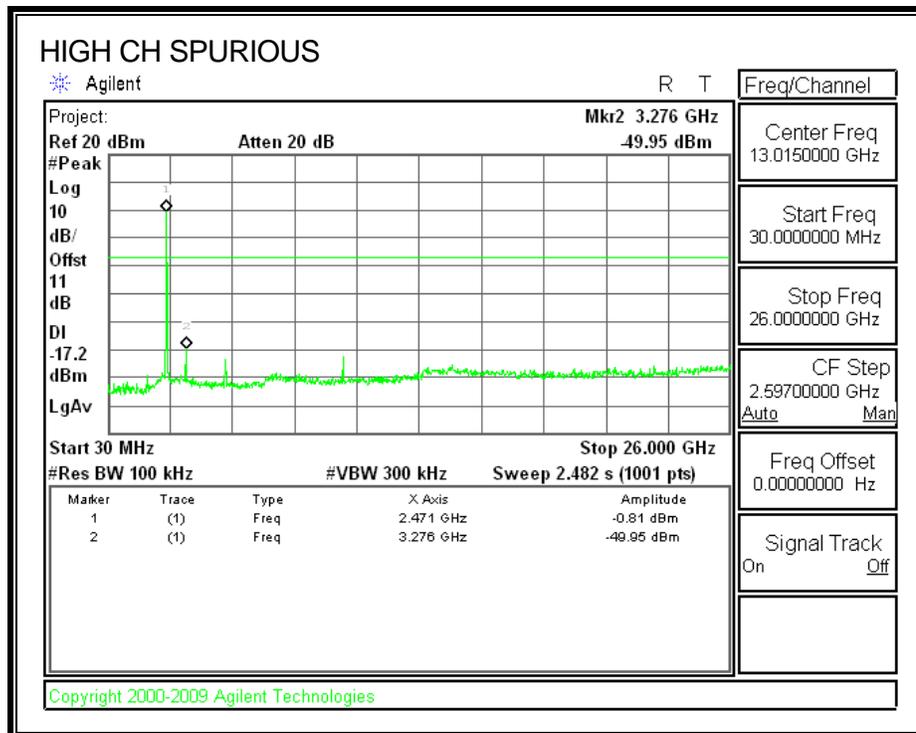
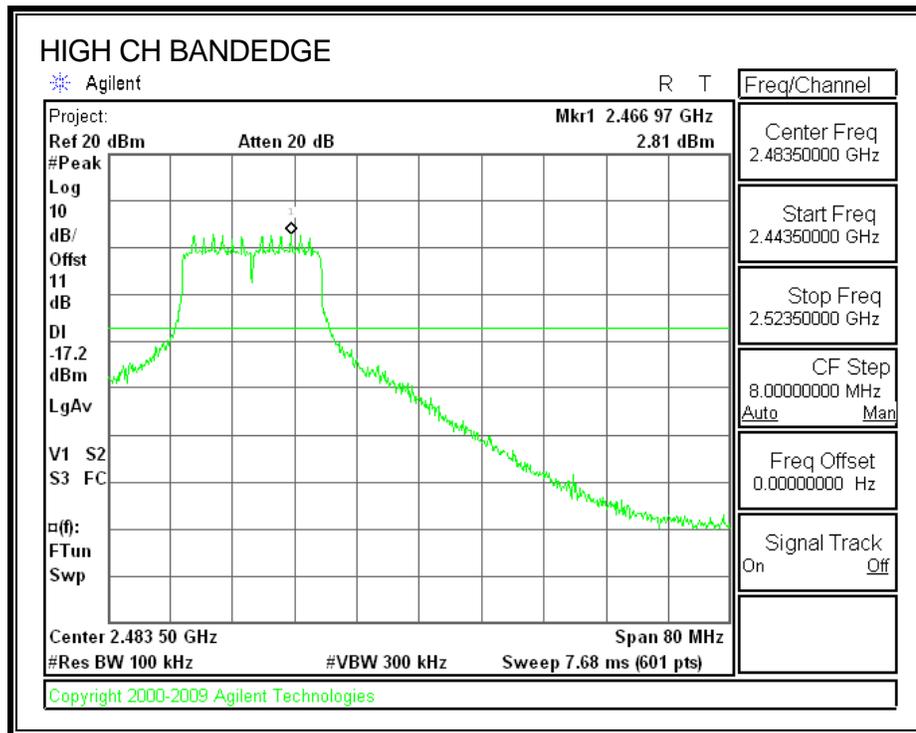
**SPURIOUS EMISSIONS, LOW CHANNEL**



**SPURIOUS EMISSIONS, MID CHANNEL**



**SPURIOUS EMISSIONS, HIGH CHANNEL**



## 8. RADIATED TEST RESULTS

### 8.1. 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.

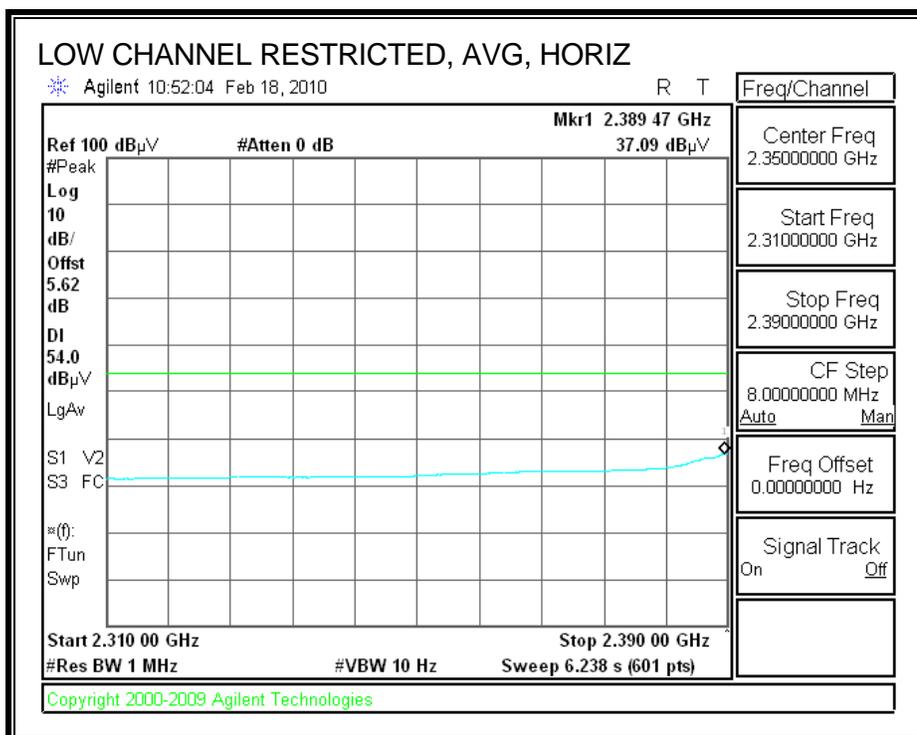
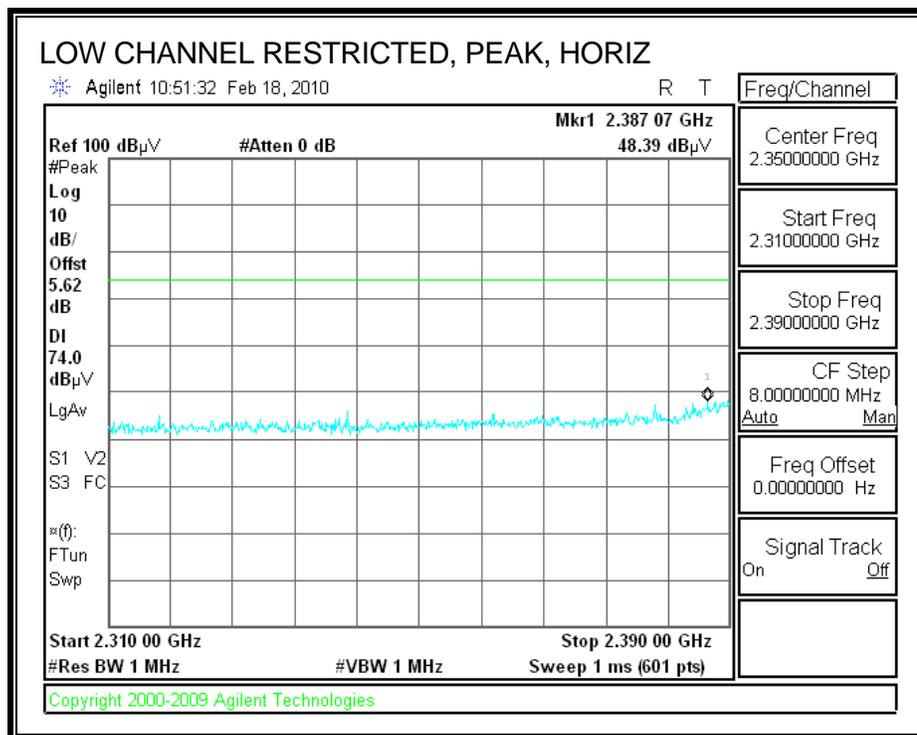
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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.

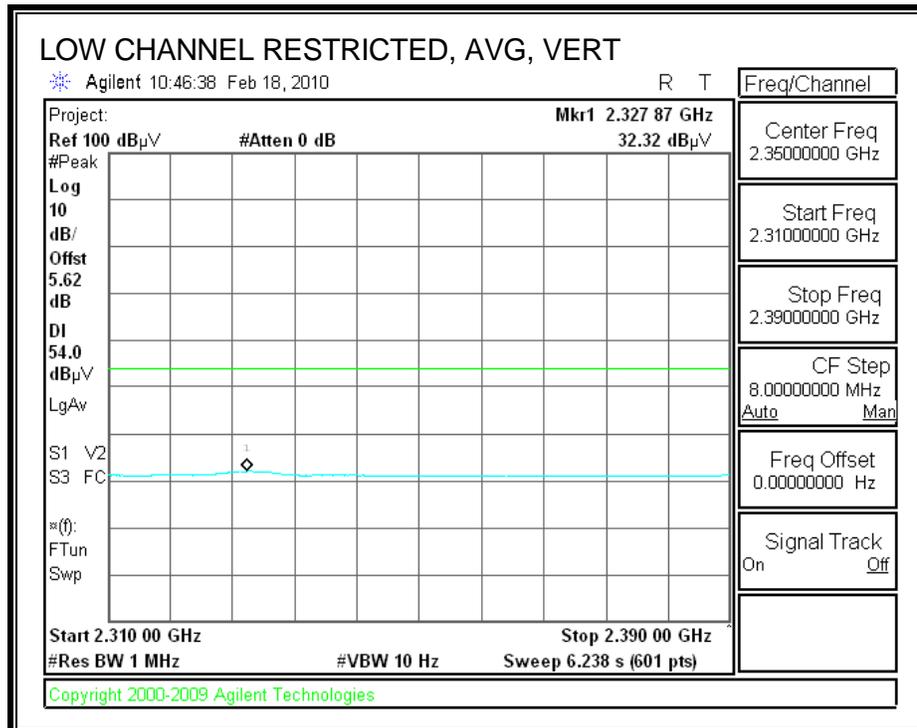
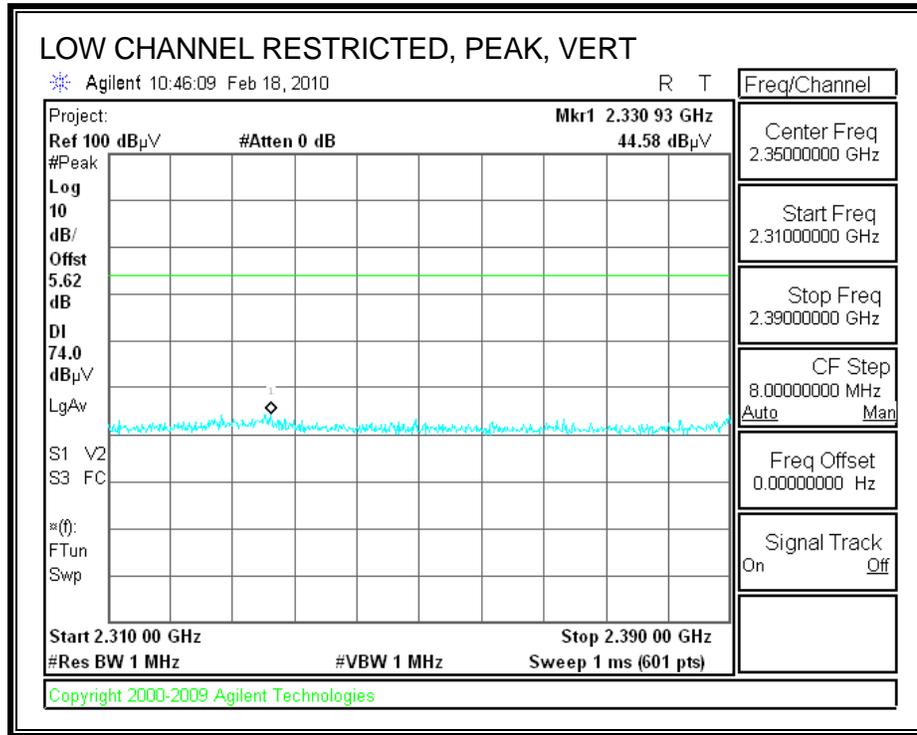
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

### 8.1.1. TRANSMITTER ABOVE 1 GHz FOR 802.11b MODE IN THE 2.4 GHz BAND

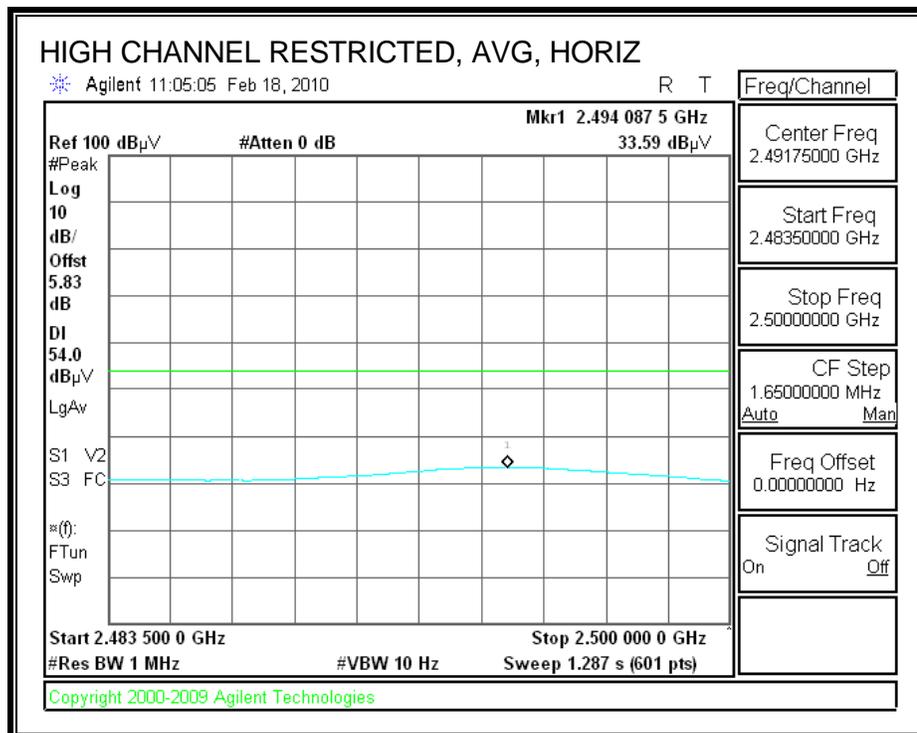
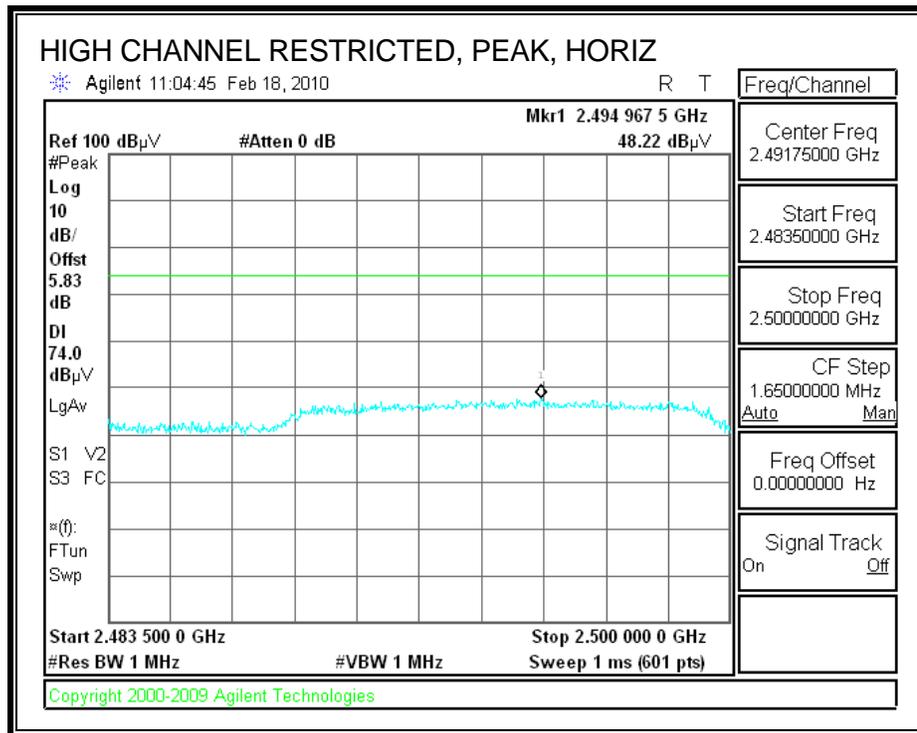
#### RESTRICTED BANEDGE (LOW CHANNEL, HORIZONTAL)



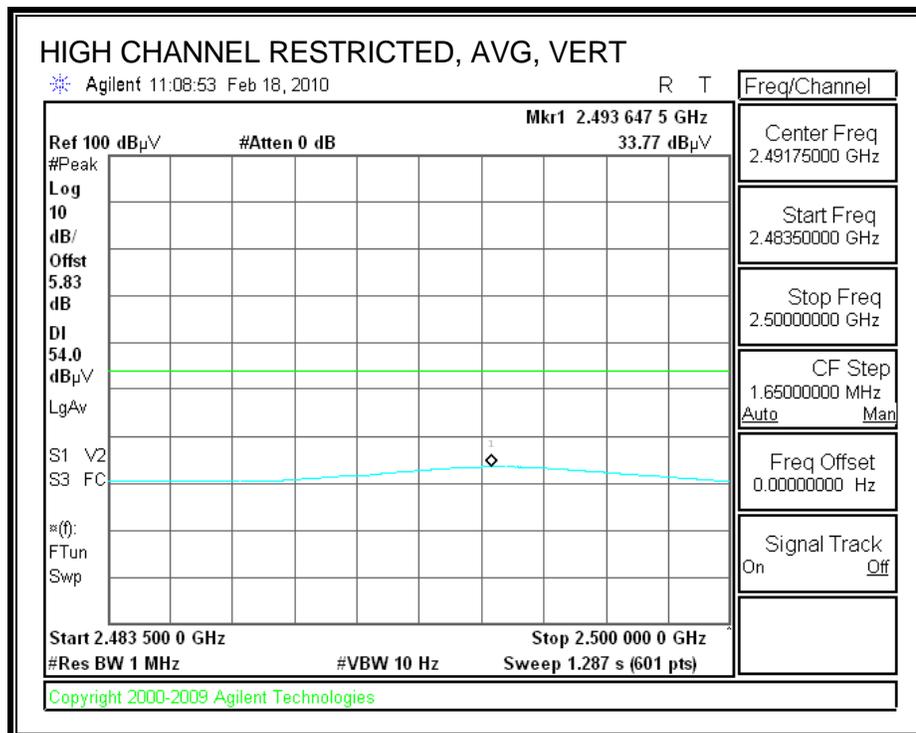
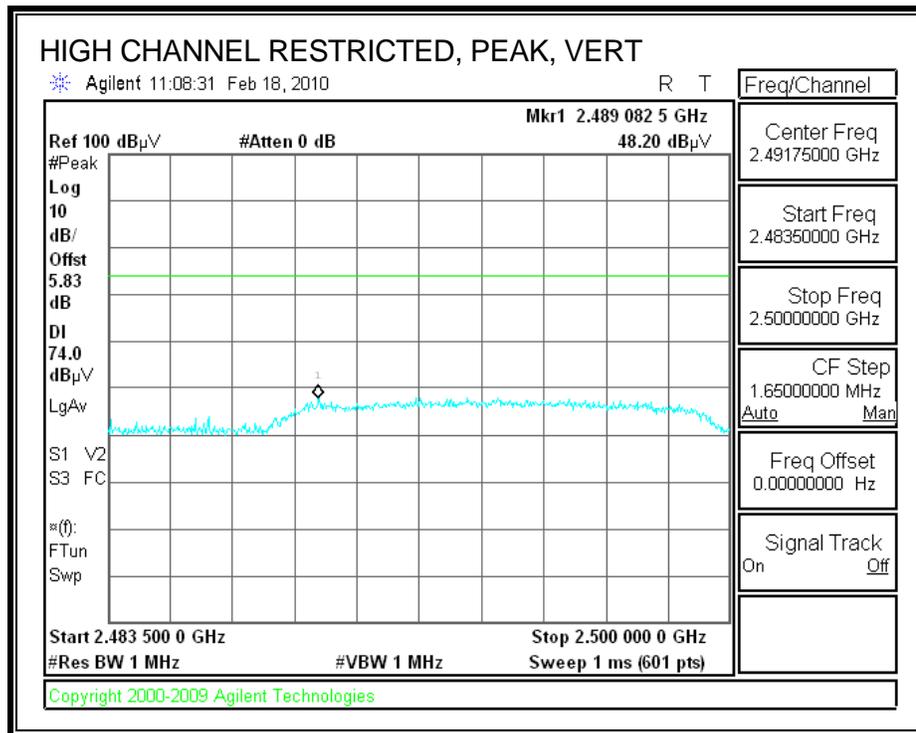
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



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



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



**HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
 Compliance Certification Services, Fremont 5m Chamber

Test Engr: Thanh Nguyen  
 Date: 04/07/10  
 Project #: 10J13147  
 Company: Sony  
 EUT Description: 801.11 bgn WLAN Module  
 EUT M/N: DWM-W038  
 Test Target: FCC 15.209  
 Mode Oper: Transmit b mode

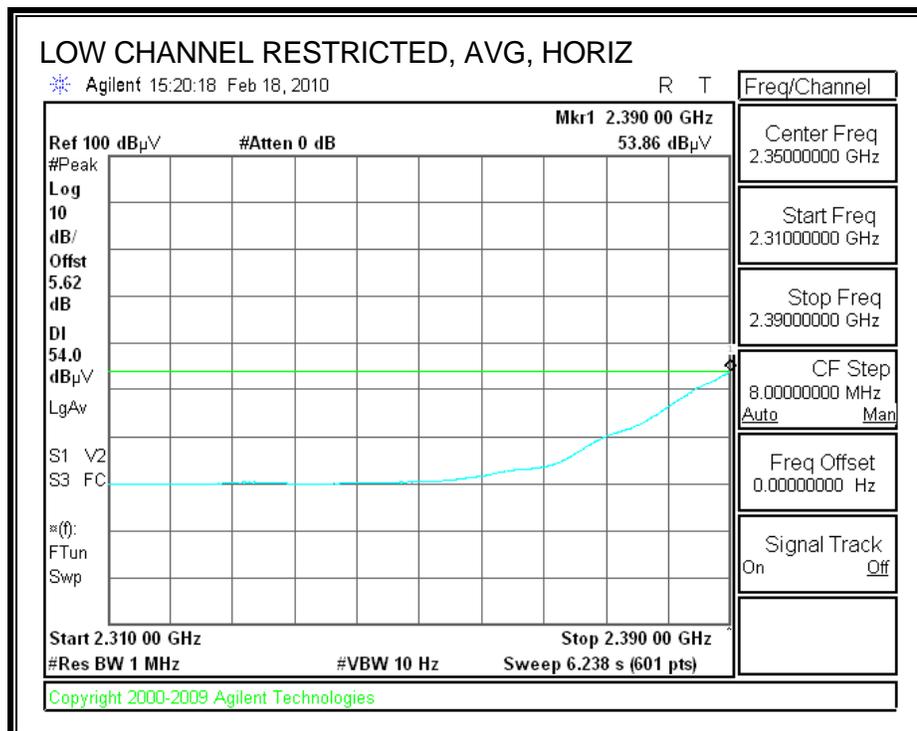
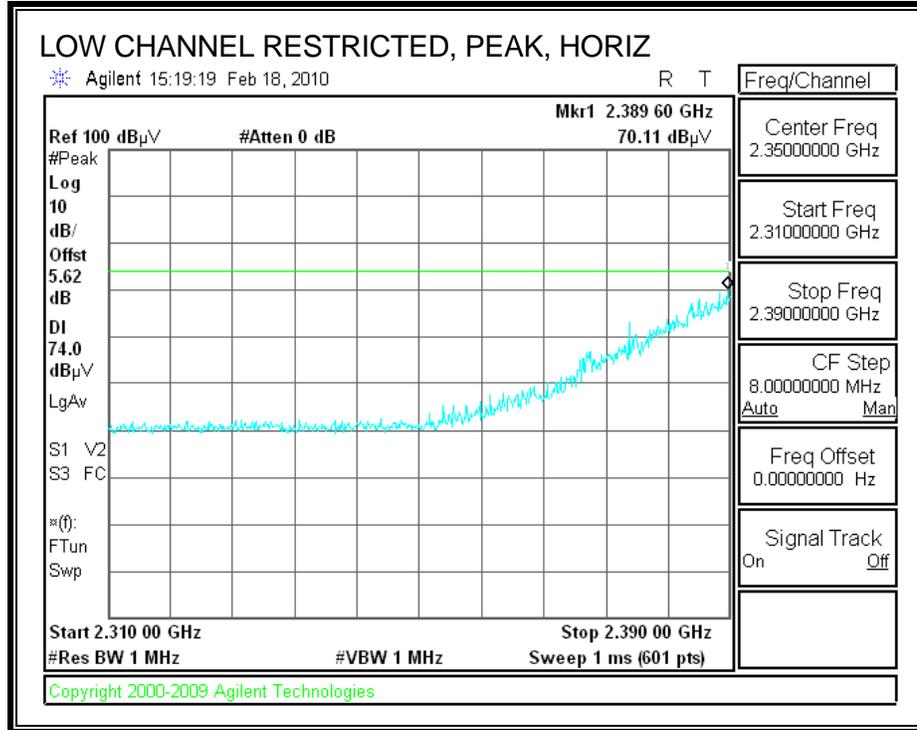
f Measurement Frequency Amp Preamp Gain Average Field Strength Limit  
 Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Limit  
 Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Limit  
 AF Antenna Factor Peak Calculated Peak Field Strength Margin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

| f GHz  | Dist (m) | Read dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Filtr dB | Corr. dBuV/m | Limit dBuV/m | Margin dB | Ant. Pol. V/H | Det. P/A/QP | Ant.High cm | Table Angle Degree | Notes |
|--|----------|-----------|---------|-------|--------|-----------|----------|--------------|--------------|-----------|---------------|-------------|-------------|--------------------|-------|
| <b>Low channel</b>                           |          |           |         |       |        |           |          |              |              |           |               |             |             |                    |       |
| 4.824  | 3.0      | 35.5      | 32.7    | 5.8   | -34.8  | 0.0       | 10.0     | 49.1         | 74.0         | -24.9     | V             | P           | 100.0       | 115.0              |       |
| 4.824  | 3.0      | 27.2      | 32.7    | 5.8   | -34.8  | 0.0       | 10.0     | 40.9         | 54.0         | -13.1     | V             | A           | 100.0       | 115.0              |       |
| 12.060                                       | 3.0      | 31.6      | 38.5    | 9.8   | -32.5  | 0.0       | 10.0     | 57.4         | 74.0         | -16.6     | V             | P           | 100.0       | 271.0              |       |
| 12.060                                       | 3.0      | 19.0      | 38.5    | 9.8   | -32.5  | 0.0       | 10.0     | 44.7         | 54.0         | -9.3      | V             | A           | 100.0       | 271.0              |       |
| 4.824  | 3.0      | 35.6      | 32.7    | 5.8   | -34.8  | 0.0       | 10.0     | 49.2         | 74.0         | -24.8     | H             | P           | 121.0       | 5.0                |       |
| 4.824  | 3.0      | 27.6      | 32.7    | 5.8   | -34.8  | 0.0       | 10.0     | 41.3         | 54.0         | -12.7     | H             | A           | 121.0       | 5.0                |       |
| 12.060                                       | 3.0      | 31.7      | 38.5    | 9.8   | -32.5  | 0.0       | 10.0     | 57.5         | 74.0         | -16.5     | H             | P           | 121.0       | 5.0                |       |
| 12.060                                       | 3.0      | 19.7      | 38.5    | 9.8   | -32.5  | 0.0       | 10.0     | 45.5         | 54.0         | -8.5      | H             | A           | 121.0       | 5.0                |       |
| <b>Mid Channel</b>                           |          |           |         |       |        |           |          |              |              |           |               |             |             |                    |       |
| 4.874  | 3.0      | 32.3      | 32.7    | 5.8   | -34.8  | 0.0       | 10.0     | 46.0         | 74.0         | -28.0     | V             | P           | 100.0       | 218.0              |       |
| 4.874  | 3.0      | 22.5      | 32.7    | 5.8   | -34.8  | 0.0       | 10.0     | 36.3         | 54.0         | -17.7     | V             | A           | 100.0       | 218.0              |       |
| 7.311  | 3.0      | 32.6      | 35.5    | 7.3   | -34.1  | 0.0       | 10.0     | 51.2         | 74.0         | -22.8     | V             | P           | 100.0       | 337.0              |       |
| 7.311  | 3.0      | 20.0      | 35.5    | 7.3   | -34.1  | 0.0       | 10.0     | 38.7         | 54.0         | -15.3     | V             | A           | 100.0       | 337.0              |       |
| 12.185                                       | 3.0      | 31.7      | 38.5    | 9.8   | -32.5  | 0.0       | 10.0     | 57.5         | 74.0         | -16.5     | V             | P           | 99.0        | 337.0              |       |
| 12.185                                       | 3.0      | 18.8      | 38.5    | 9.8   | -32.5  | 0.0       | 10.0     | 44.6         | 54.0         | -9.4      | V             | A           | 99.0        | 337.0              |       |
| 4.874  | 3.0      | 35.6      | 32.7    | 5.8   | -34.8  | 0.0       | 10.0     | 49.3         | 74.0         | -24.7     | H             | P           | 99.0        | 339.0              |       |
| 4.874  | 3.0      | 29.6      | 32.7    | 5.8   | -34.8  | 0.0       | 10.0     | 43.3         | 54.0         | -10.7     | H             | A           | 99.0        | 339.0              |       |
| 7.311  | 3.0      | 32.2      | 35.5    | 7.3   | -34.1  | 0.0       | 10.0     | 50.8         | 74.0         | -23.2     | H             | P           | 100.0       | 69.0               |       |
| 7.311  | 3.0      | 19.9      | 35.5    | 7.3   | -34.1  | 0.0       | 10.0     | 38.5         | 54.0         | -15.5     | H             | A           | 100.0       | 69.0               |       |
| 12.185                                       | 3.0      | 30.9      | 38.5    | 9.8   | -32.5  | 0.0       | 10.0     | 56.7         | 74.0         | -17.3     | H             | P           | 99.0        | 69.0               |       |
| 12.185                                       | 3.0      | 18.8      | 38.5    | 9.8   | -32.5  | 0.0       | 10.0     | 44.6         | 54.0         | -9.4      | H             | A           | 99.0        | 69.0               |       |
| <b>High Channel</b>                          |          |           |         |       |        |           |          |              |              |           |               |             |             |                    |       |
| 4.924  | 3.0      | 33.8      | 32.7    | 5.9   | -34.8  | 0.0       | 10.0     | 47.6         | 74.0         | -26.4     | V             | P           | 100.0       | 360.0              |       |
| 4.924  | 3.0      | 22.0      | 32.7    | 5.9   | -34.8  | 0.0       | 10.0     | 35.8         | 54.0         | -18.2     | V             | A           | 100.0       | 360.0              |       |
| 7.386  | 3.0      | 32.4      | 35.6    | 7.3   | -34.1  | 0.0       | 10.0     | 51.2         | 74.0         | -22.8     | V             | P           | 100.0       | 97.0               |       |
| 7.386  | 3.0      | 20.6      | 35.6    | 7.3   | -34.1  | 0.0       | 10.0     | 39.4         | 54.0         | -14.6     | V             | A           | 100.0       | 97.0               |       |
| 9.848  | 3.0      | 31.6      | 37.6    | 8.7   | -33.1  | 0.0       | 10.0     | 54.8         | 74.0         | -19.2     | V             | P           | 100.0       | 288.0              |       |
| 9.848  | 3.0      | 19.7      | 37.6    | 8.7   | -33.1  | 0.0       | 10.0     | 42.9         | 54.0         | -11.1     | V             | A           | 100.0       | 288.0              |       |
| 4.924  | 3.0      | 39.2      | 32.7    | 5.9   | -34.8  | 0.0       | 10.0     | 53.0         | 74.0         | -21.0     | H             | P           | 99.0        | 18.0               |       |
| 4.924  | 3.0      | 36.2      | 32.7    | 5.9   | -34.8  | 0.0       | 10.0     | 50.0         | 54.0         | -4.0      | H             | A           | 99.0        | 18.0               |       |
| 7.386  | 3.0      | 32.8      | 35.6    | 7.3   | -34.1  | 0.0       | 10.0     | 51.6         | 74.0         | -22.4     | H             | P           | 100.0       | 81.0               |       |
| 7.386  | 3.0      | 20.5      | 35.6    | 7.3   | -34.1  | 0.0       | 10.0     | 39.2         | 54.0         | -14.8     | H             | A           | 100.0       | 81.0               |       |
| 9.848  | 3.0      | 31.6      | 37.6    | 8.7   | -33.1  | 0.0       | 10.0     | 54.8         | 74.0         | -19.2     | H             | P           | 100.0       | 329.0              |       |
| 9.848  | 3.0      | 19.5      | 37.6    | 8.7   | -33.1  | 0.0       | 10.0     | 42.7         | 54.0         | -11.3     | H             | A           | 100.0       | 329.0              |       |
| No other emissions above system noise floor. |          |           |         |       |        |           |          |              |              |           |               |             |             |                    |       |

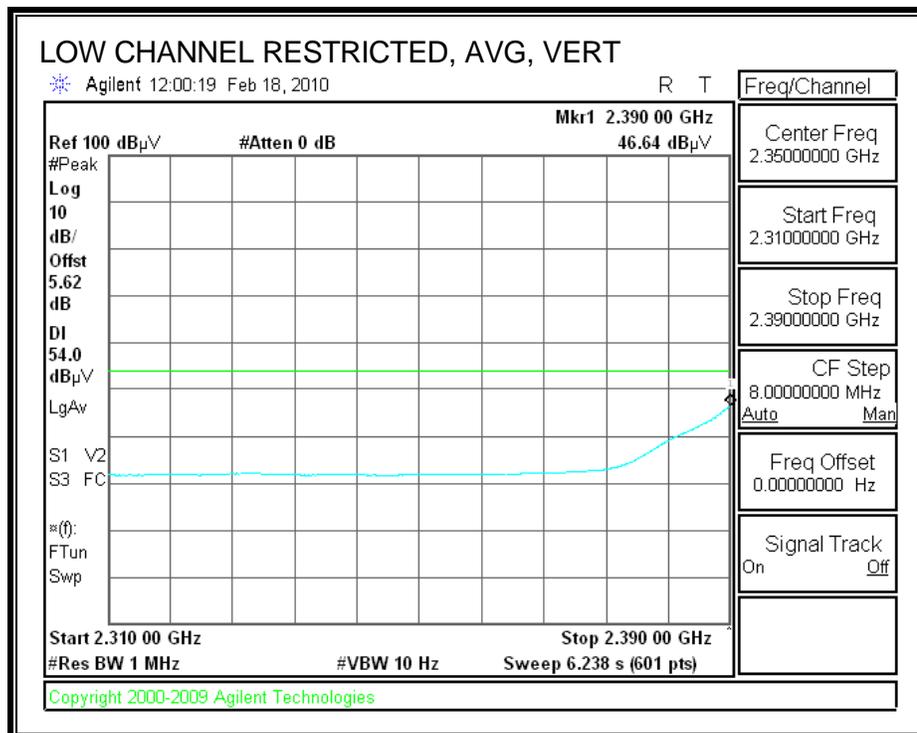
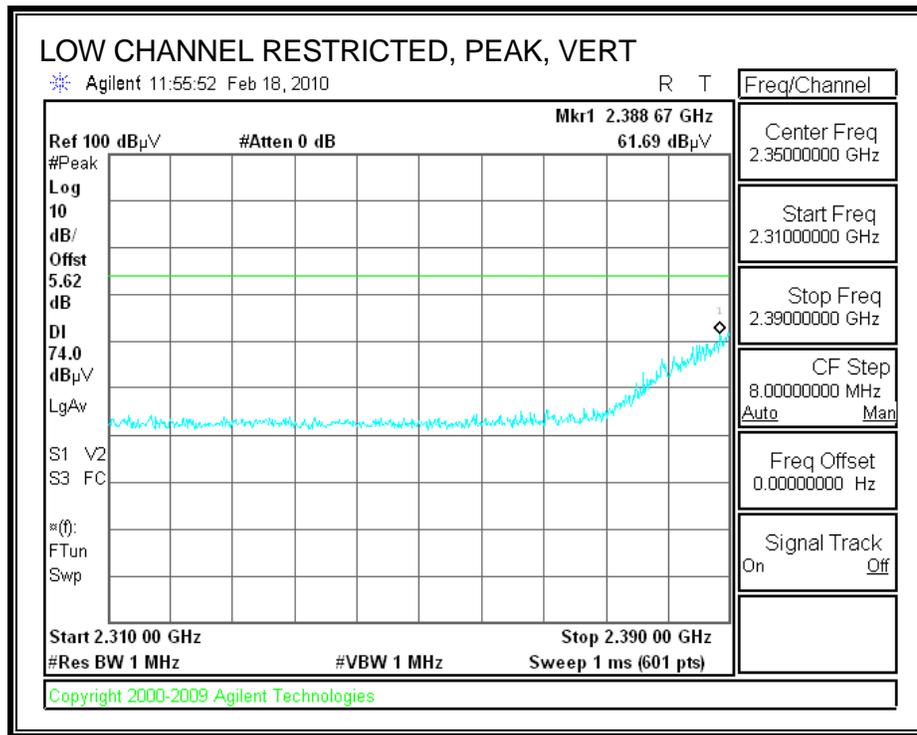
Rev. 4.1.2.7  
 Note: No other emissions were detected above the system noise floor.

### 8.1.2. TRANSMITTER ABOVE 1 GHz FOR 802.11g MODE IN THE 2.4 GHz BAND

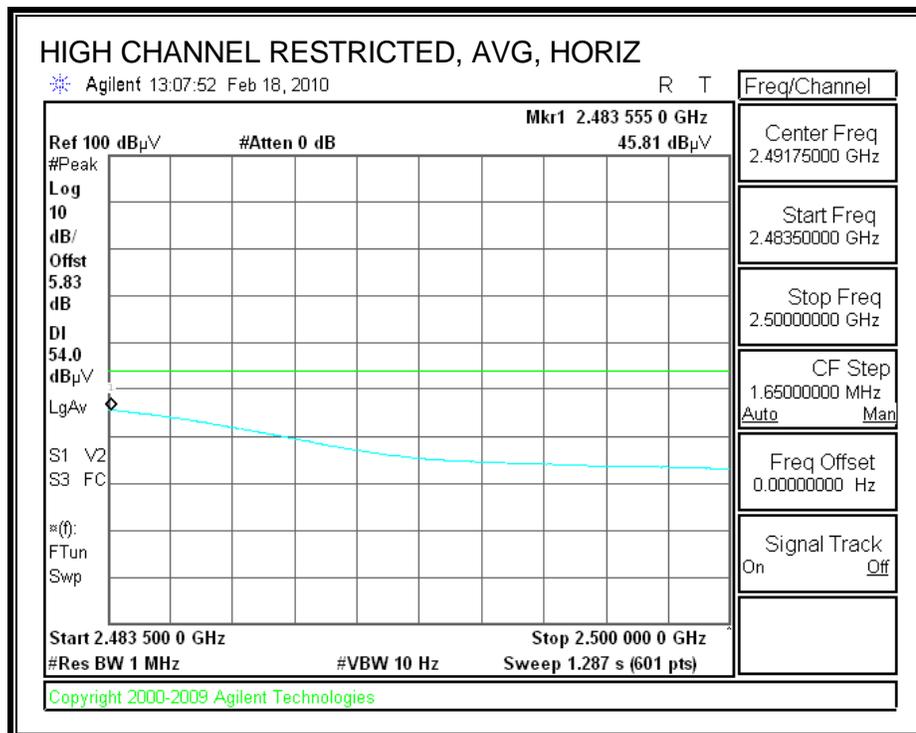
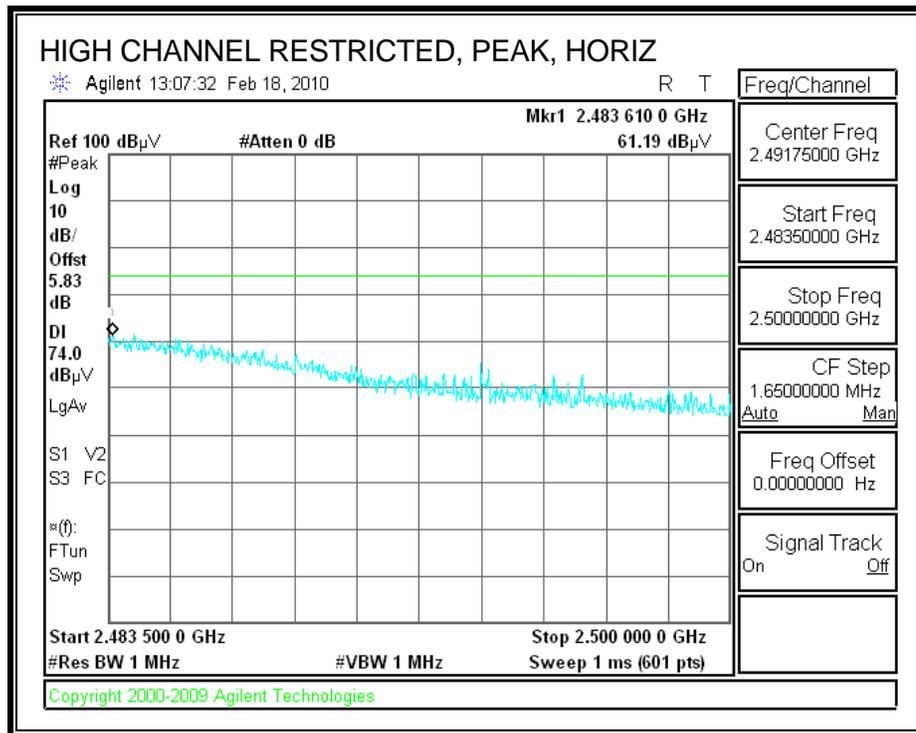
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



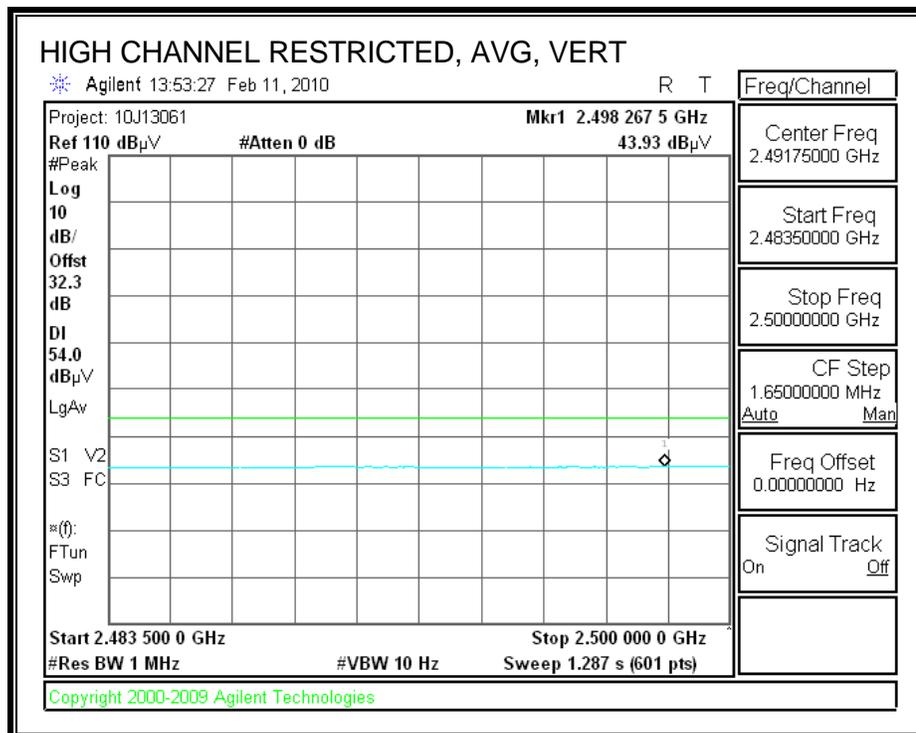
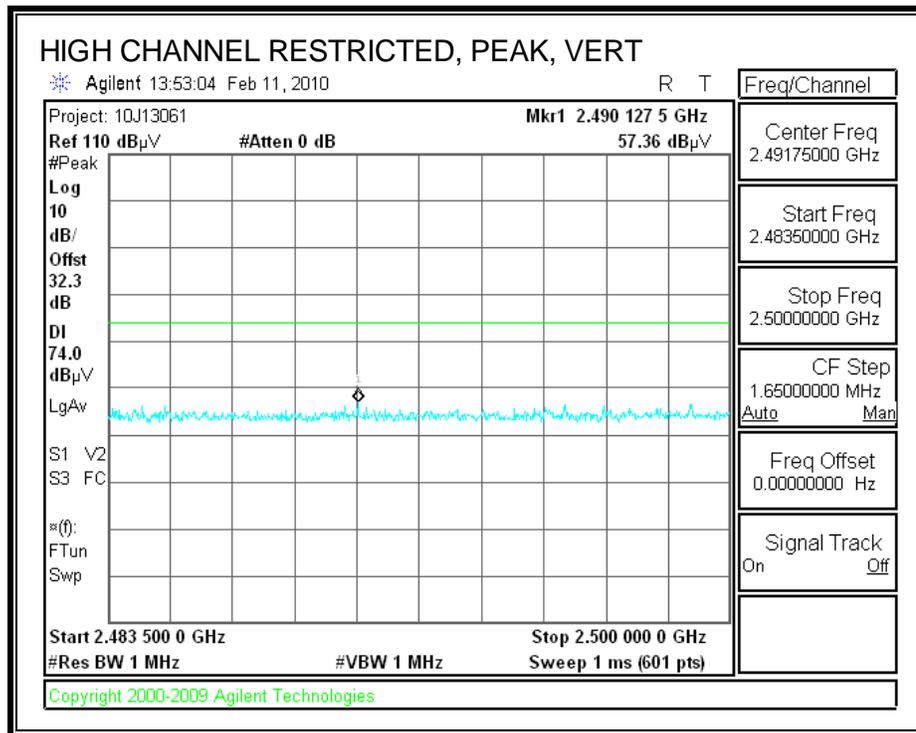
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



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



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

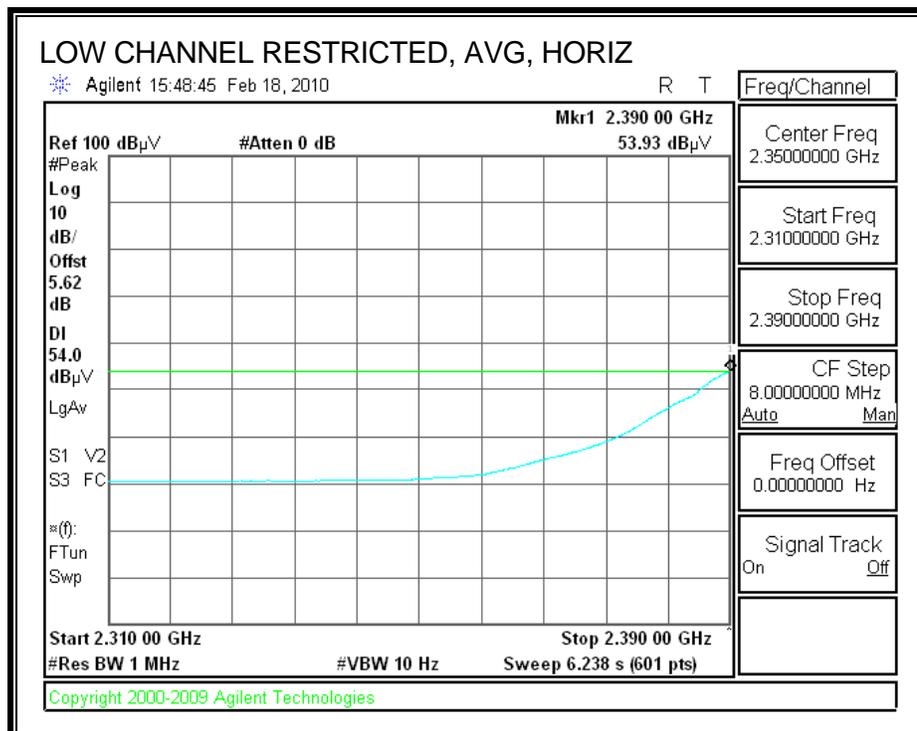
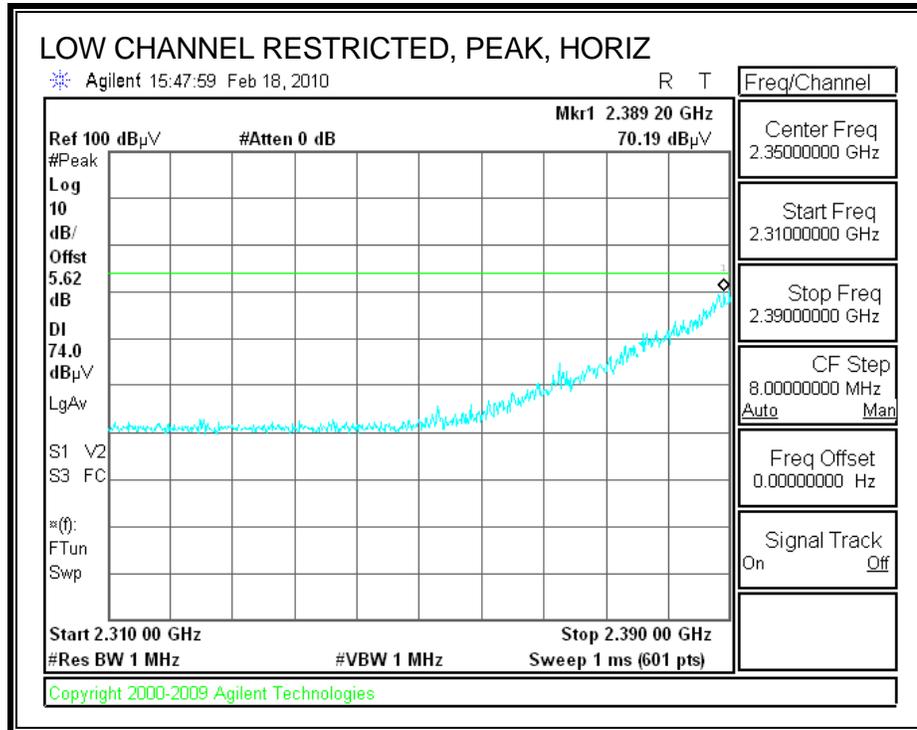


**HARMONICS AND SPURIOUS EMISSIONS**

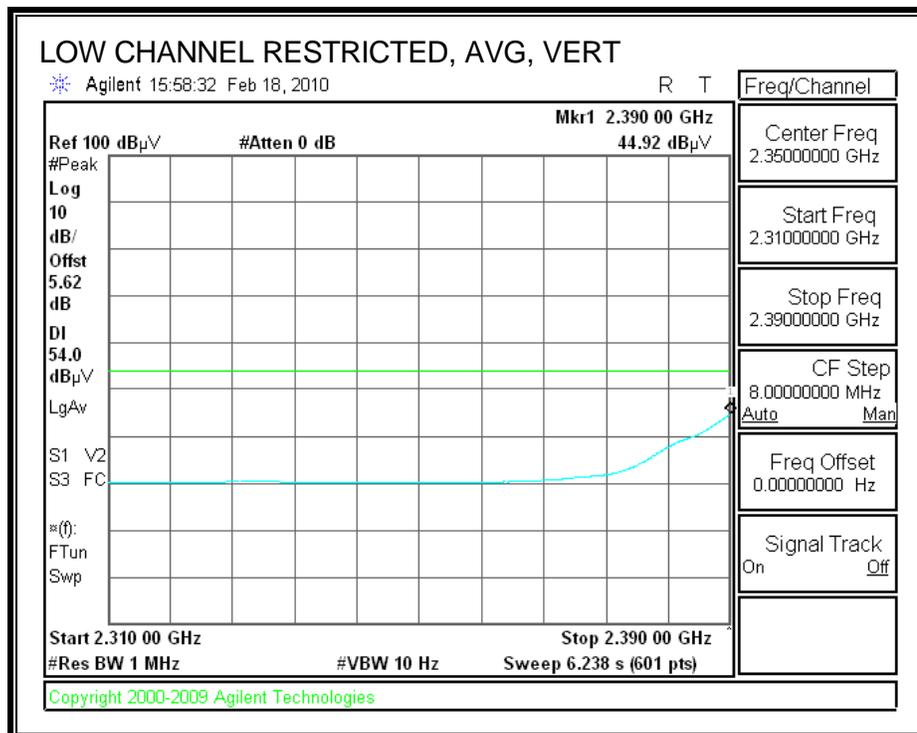
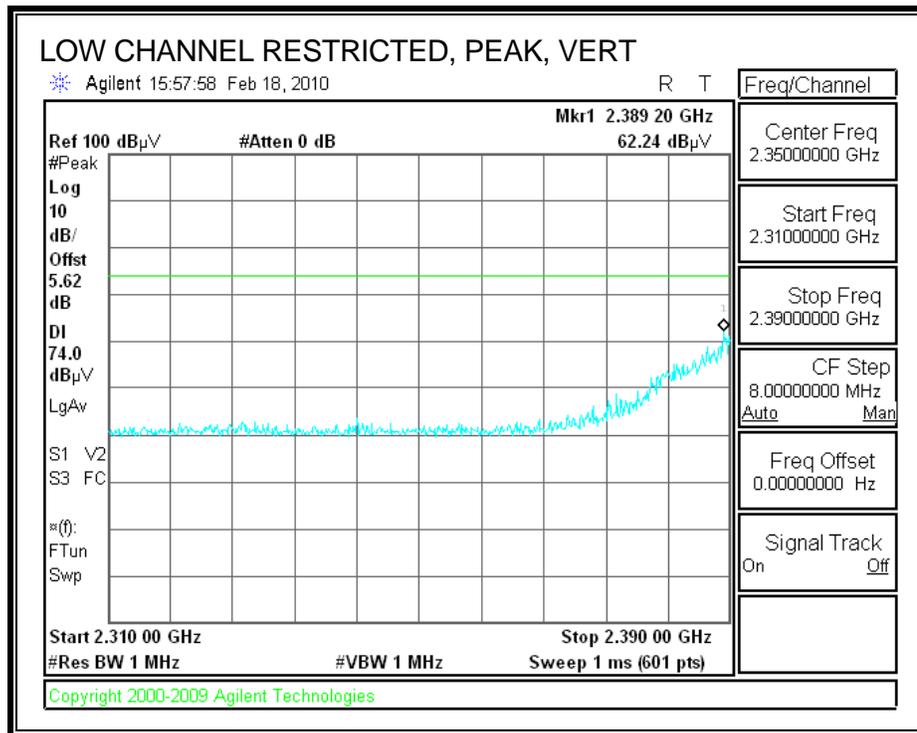
| High Frequency Measurement   |                       |                        |            |          |                                |              |                              |                 |                 |              |                  |                |                |                       |       |
|--|-----------------------|------------------------|------------|----------|--------------------------------|--------------|------------------------------|-----------------|-----------------|--------------|------------------|----------------|----------------|-----------------------|-------|
| Compliance Certification Services, Fremont 5m Chamber                |                       |                        |            |          |                                |              |                              |                 |                 |              |                  |                |                |                       |       |
| Test Engr:   |                       | Thanh Nguyen           |            |          |                                |              |                              |                 |                 |              |                  |                |                |                       |       |
| Date:  |                       | 04/07/10               |            |          |                                |              |                              |                 |                 |              |                  |                |                |                       |       |
| Project #:   |                       | 10J13147               |            |          |                                |              |                              |                 |                 |              |                  |                |                |                       |       |
| Company:   |                       | Sony                   |            |          |                                |              |                              |                 |                 |              |                  |                |                |                       |       |
| EUT Description:   |                       | 801.11 bgn WLAN Module |            |          |                                |              |                              |                 |                 |              |                  |                |                |                       |       |
| EUT M/N:   |                       | DWM-W038               |            |          |                                |              |                              |                 |                 |              |                  |                |                |                       |       |
| Test Target:   |                       | FCC 15.209             |            |          |                                |              |                              |                 |                 |              |                  |                |                |                       |       |
| Mode Oper:   |                       | Transmit g mode        |            |          |                                |              |                              |                 |                 |              |                  |                |                |                       |       |
| f  | Measurement Frequency |                        | Amp        |          | Preamp Gain                    |              | Average Field Strength Limit |                 |                 |              |                  |                |                |                       |       |
| Dist   | Distance to Antenna   |                        | D Corr     |          | Distance Correct to 3 meters   |              |                              |                 |                 |              |                  |                |                |                       |       |
| Read   | Analyzer Reading      |                        | Avg        |          | Average Field Strength @ 3 m   |              |                              |                 |                 |              |                  |                |                |                       |       |
| AF   | Antenna Factor        |                        | Peak       |          | Calculated Peak Field Strength |              |                              |                 |                 |              |                  |                |                |                       |       |
| 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 | Ant.High<br>cm | Table Angle<br>Degree | Notes |
| <b>Low Channel</b>   |                       |                        |            |          |                                |              |                              |                 |                 |              |                  |                |                |                       |       |
| 4.824  | 3.0                   | 33.3                   | 32.7       | 5.8      | -34.8                          | 0.0          | 10.0                         | 47.0            | 74.0            | -27.0        | V                | P              | 100.0          | 239.0                 |       |
| 4.824  | 3.0                   | 20.7                   | 32.7       | 5.8      | -34.8                          | 0.0          | 10.0                         | 34.4            | 54.0            | -19.6        | V                | A              | 100.0          | 239.0                 |       |
| 7.236  | 3.0                   | 32.3                   | 35.4       | 7.2      | -34.1                          | 0.0          | 10.0                         | 50.7            | 74.0            | -23.3        | V                | P              | 100.0          | 144.0                 |       |
| 7.236  | 3.0                   | 20.0                   | 35.4       | 7.2      | -34.1                          | 0.0          | 10.0                         | 38.4            | 54.0            | -15.6        | V                | A              | 100.0          | 144.0                 |       |
| 4.824  | 3.0                   | 32.9                   | 32.7       | 5.8      | -34.8                          | 0.0          | 10.0                         | 46.6            | 74.0            | -27.4        | H                | P              | 101.0          | 100.0                 |       |
| 4.824  | 3.0                   | 20.0                   | 32.7       | 5.8      | -34.8                          | 0.0          | 10.0                         | 33.6            | 54.0            | -20.4        | H                | A              | 101.0          | 100.0                 |       |
| 7.236  | 3.0                   | 32.2                   | 35.4       | 7.2      | -34.1                          | 0.0          | 10.0                         | 50.6            | 74.0            | -23.4        | H                | P              | 101.0          | 100.0                 |       |
| 7.236  | 3.0                   | 19.7                   | 35.4       | 7.2      | -34.1                          | 0.0          | 10.0                         | 38.2            | 54.0            | -15.8        | H                | A              | 101.0          | 100.0                 |       |
| <b>Mid Channel</b>   |                       |                        |            |          |                                |              |                              |                 |                 |              |                  |                |                |                       |       |
| 4.824  | 3.0                   | 35.2                   | 32.7       | 5.8      | -34.8                          | 0.0          | 10.0                         | 48.8            | 74.0            | -25.2        | V                | P              | 99.0           | 273.0                 |       |
| 4.824  | 3.0                   | 22.4                   | 32.7       | 5.8      | -34.8                          | 0.0          | 10.0                         | 36.0            | 54.0            | -18.0        | V                | A              | 99.0           | 273.0                 |       |
| 7.311  | 3.0                   | 32.6                   | 35.5       | 7.3      | -34.1                          | 0.0          | 10.0                         | 51.2            | 74.0            | -22.8        | V                | P              | 100.0          | 89.0                  |       |
| 7.311  | 3.0                   | 20.4                   | 35.5       | 7.3      | -34.1                          | 0.0          | 10.0                         | 39.1            | 54.0            | -14.9        | V                | A              | 100.0          | 89.0                  |       |
| 4.874  | 3.0                   | 37.2                   | 32.7       | 5.8      | -34.8                          | 0.0          | 10.0                         | 50.9            | 74.0            | -23.1        | H                | P              | 100.0          | 337.0                 |       |
| 4.874  | 3.0                   | 23.9                   | 32.7       | 5.8      | -34.8                          | 0.0          | 10.0                         | 37.6            | 54.0            | -16.4        | H                | A              | 100.0          | 337.0                 |       |
| 7.311  | 3.0                   | 32.4                   | 35.5       | 7.3      | -34.1                          | 0.0          | 10.0                         | 51.0            | 74.0            | -23.0        | H                | P              | 100.0          | 234.0                 |       |
| 7.311  | 3.0                   | 20.1                   | 35.5       | 7.3      | -34.1                          | 0.0          | 10.0                         | 38.7            | 54.0            | -15.3        | H                | A              | 100.0          | 234.0                 |       |
| <b>High Channel</b>  |                       |                        |            |          |                                |              |                              |                 |                 |              |                  |                |                |                       |       |
| 4.924  | 3.0                   | 34.1                   | 32.7       | 5.9      | -34.8                          | 0.0          | 10.0                         | 48.0            | 74.0            | -26.0        | V                | P              | 99.0           | 209.0                 |       |
| 4.924  | 3.0                   | 21.7                   | 32.7       | 5.9      | -34.8                          | 0.0          | 10.0                         | 35.5            | 54.0            | -18.5        | V                | A              | 99.0           | 209.0                 |       |
| 7.386  | 3.0                   | 32.5                   | 35.6       | 7.3      | -34.1                          | 0.0          | 10.0                         | 51.3            | 74.0            | -22.7        | V                | P              | 100.0          | 138.0                 |       |
| 7.386  | 3.0                   | 20.1                   | 35.6       | 7.3      | -34.1                          | 0.0          | 10.0                         | 38.9            | 54.0            | -15.1        | V                | A              | 100.0          | 138.0                 |       |
| 4.924  | 3.0                   | 40.2                   | 32.7       | 5.9      | -34.8                          | 0.0          | 10.0                         | 54.0            | 74.0            | -20.0        | H                | P              | 100.0          | 9.0                   |       |
| 4.924  | 3.0                   | 27.3                   | 32.7       | 5.9      | -34.8                          | 0.0          | 10.0                         | 41.1            | 54.0            | -12.9        | H                | A              | 100.0          | 9.0                   |       |
| 7.386  | 3.0                   | 32.2                   | 35.6       | 7.3      | -34.1                          | 0.0          | 10.0                         | 50.9            | 74.0            | -23.1        | H                | P              | 100.0          | 199.0                 |       |
| 7.386  | 3.0                   | 20.5                   | 35.6       | 7.3      | -34.1                          | 0.0          | 10.0                         | 39.3            | 54.0            | -14.7        | H                | A              | 100.0          | 199.0                 |       |
| Rev. 4.1.2.7   |                       |                        |            |          |                                |              |                              |                 |                 |              |                  |                |                |                       |       |
| Note: No other emissions were detected above the system noise floor. |                       |                        |            |          |                                |              |                              |                 |                 |              |                  |                |                |                       |       |

### 8.1.3. TRANSMITTER ABOVE 1 GHz FOR HT 20 MODE IN THE 2.4 GHz BAND

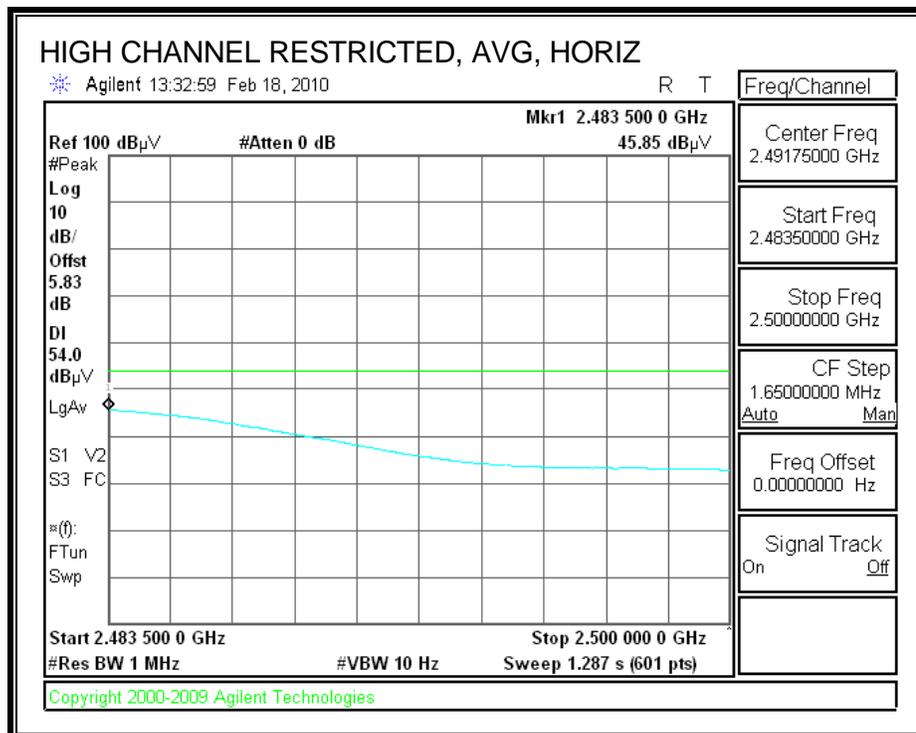
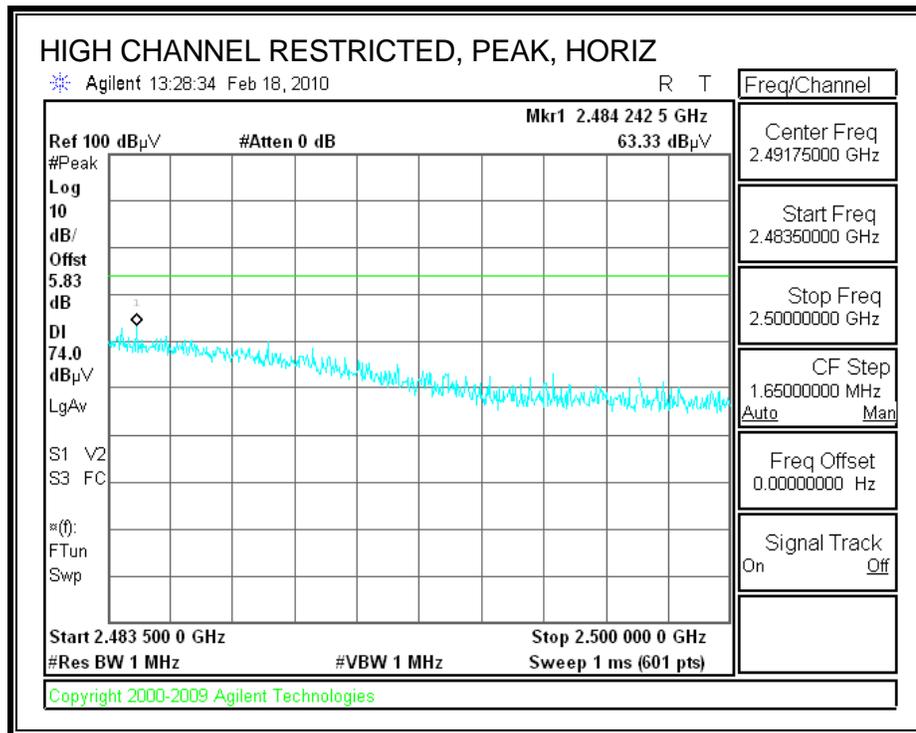
#### RESTRICTED BANEDGE (LOW CHANNEL, HORIZONTAL)



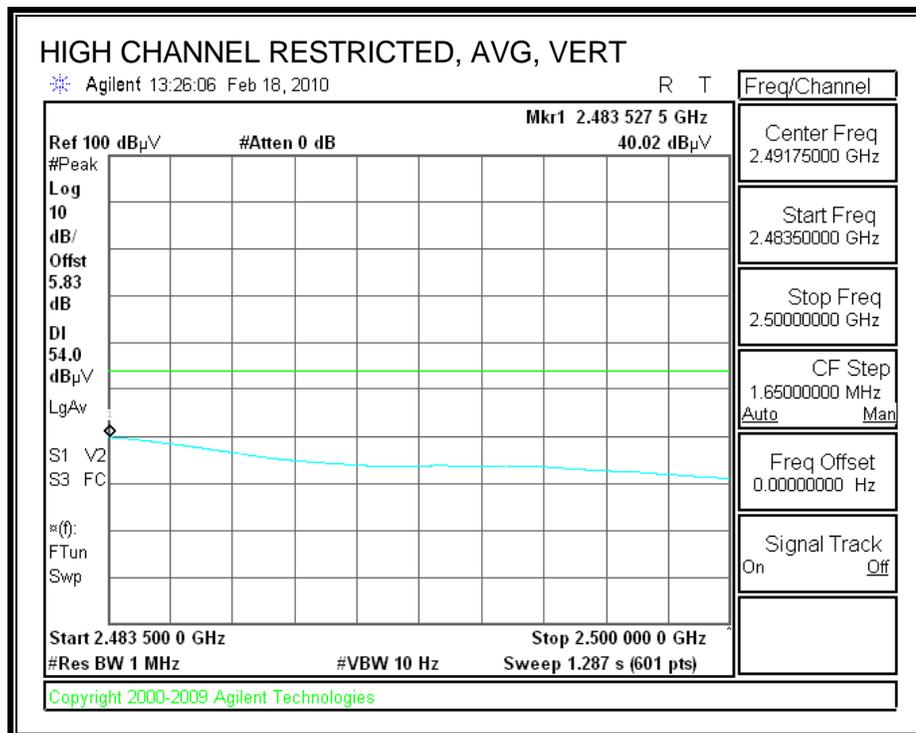
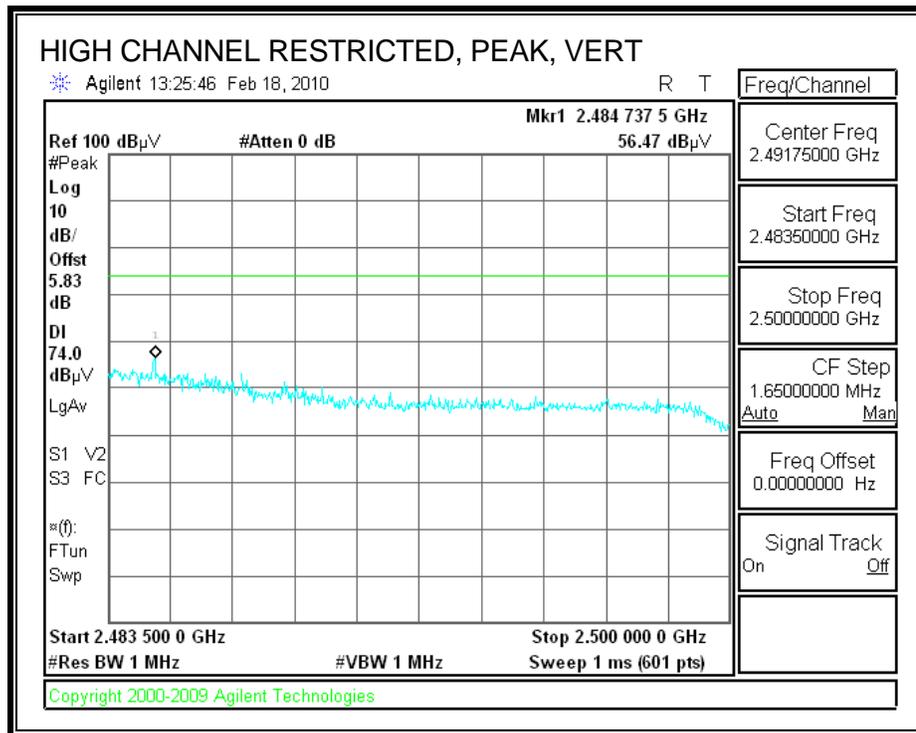
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



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



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



**HARMONICS AND SPURIOUS EMISSIONS**

| High Frequency Measurement                            |                       |                               |                        |      |     |                       |                                |       |              |        |               |            |  |         |             |  |  |
|---|-----------------------|-------------------------------|------------------------|------|-----|-----------------------|--------------------------------|-------|--------------|--------|---------------|------------|--|---------|-------------|--|--|
| Compliance Certification Services, Fremont 5m Chamber |                       |                               |                        |      |     |                       |                                |       |              |        |               |            |  |         |             |  |  |
| Company:  |                       | SONY                          |                        |      |     |                       |                                |       |              |        |               |            |  |         |             |  |  |
| Project #:  |                       | 10J13147                      |                        |      |     |                       |                                |       |              |        |               |            |  |         |             |  |  |
| Date:   |                       | 4/7/10                        |                        |      |     |                       |                                |       |              |        |               |            |  |         |             |  |  |
| Test Engineer:  |                       | Thanh Nguyen                  |                        |      |     |                       |                                |       |              |        |               |            |  |         |             |  |  |
| Configuration:  |                       | EUT, Test JIG, Support Laptop |                        |      |     |                       |                                |       |              |        |               |            |  |         |             |  |  |
| Mode:   |                       | Transmit HT20 mode            |                        |      |     |                       |                                |       |              |        |               |            |  |         |             |  |  |
| <b>Test Equipment:</b>                                |                       |                               |                        |      |     |                       |                                |       |              |        |               |            |  |         |             |  |  |
| Horn 1-18GHz  |                       |                               | Pre-amplifer 1-26GHz   |      |     | Pre-amplifer 26-40GHz |                                |       | Horn > 18GHz |        |               | Limit      |  |         |             |  |  |
| T60; S/N: 2238 @3m                                    |                       |                               | T145 Agilent 3008A0056 |      |     |                       |                                |       |              |        |               | FCC 15.209 |  |         |             |  |  |
| Hi Frequency Cables                                   |                       |                               |                        |      |     |                       |                                |       |              |        |               |            |  |         |             |  |  |
| 3' cable 22807700                                     |                       |                               | 12' cable 22807600     |      |     | 20' cable 22807500    |                                |       | HPF          |        | Reject Filter |            | Peak Measurements<br>RBW=VBW=1MHz          |         |             |  |  |
| 3' cable 22807700                                     |                       |                               | 12' cable 22807600     |      |     | 20' cable 22807500    |                                |       |              |        | R_001         |            | Average Measurements<br>RBW=1MHz; VBW=10Hz |         |             |  |  |
| f   | Dist                  | Read Pk                       | Read Avg.              | AF   | CL  | Amp                   | D Corr                         | Filtr | Peak         | Avg    | Pk Lim        | Avg Lim    | Pk Mar                                     | Avg Mar | Notes       |  |  |
| GHz   | (m)                   | dBuV                          | dBuV                   | dB/m | dB  | dB                    | dB                             | dB    | dBuV/m       | dBuV/m | dBuV/m        | dBuV/m     | dB   | dB      | (V/H)       |  |  |
| <b>Harmonics Spurious</b>                             |                       |                               |                        |      |     |                       |                                |       |              |        |               |            |  |         |             |  |  |
| <b>Low Ch</b>   |                       |                               |                        |      |     |                       |                                |       |              |        |               |            |  |         |             |  |  |
| 4.824   | 3.0                   | 39.4                          | 29.3                   | 32.7 | 5.8 | -34.8                 | 0.0                            | 0.0   | 43.1         | 33.0   | 74            | 54         | -30.9                                      | -21.0   | Y           |  |  |
| 7.263   | 3.0                   | 36.9                          | 27.6                   | 35.4 | 7.2 | -34.7                 | 0.0                            | 0.0   | 44.9         | 35.6   | 74            | 54         | -29.1                                      | -18.4   | Noise Floor |  |  |
| 4.824   | 3.0                   | 40.1                          | 29.1                   | 32.7 | 5.8 | -34.8                 | 0.0                            | 0.0   | 43.7         | 32.7   | 74            | 54         | -30.3                                      | -21.3   | H           |  |  |
| 7.263   | 3.0                   | 38.5                          | 27.6                   | 35.4 | 7.2 | -34.7                 | 0.0                            | 0.0   | 46.5         | 35.6   | 74            | 54         | -27.5                                      | -18.4   | Noise Floor |  |  |
| <b>Mid Ch</b>   |                       |                               |                        |      |     |                       |                                |       |              |        |               |            |  |         |             |  |  |
| 4.874   | 3.0                   | 39.2                          | 28.9                   | 32.7 | 5.8 | -34.9                 | 0.0                            | 0.0   | 42.8         | 32.6   | 74            | 54         | -31.2                                      | -21.4   | Y           |  |  |
| 7.311   | 3.0                   | 37.9                          | 27.7                   | 35.5 | 7.3 | -34.7                 | 0.0                            | 0.0   | 46.0         | 35.7   | 74            | 54         | -28.0                                      | -18.3   | Noise Floor |  |  |
| 4.874   | 3.0                   | 39.3                          | 26.0                   | 32.7 | 5.8 | -34.9                 | 0.0                            | 0.0   | 43.0         | 29.7   | 74            | 54         | -31.0                                      | -24.3   | H           |  |  |
| 7.311   | 3.0                   | 36.9                          | 27.7                   | 35.5 | 7.3 | -34.7                 | 0.0                            | 0.0   | 45.0         | 35.7   | 74            | 54         | -29.0                                      | -18.3   | Noise Floor |  |  |
| <b>High Ch</b>  |                       |                               |                        |      |     |                       |                                |       |              |        |               |            |  |         |             |  |  |
| 4.924   | 3.0                   | 39.4                          | 28.8                   | 32.7 | 5.9 | -34.9                 | 0.0                            | 0.0   | 43.2         | 32.5   | 74            | 54         | -30.8                                      | -21.5   | Y           |  |  |
| 7.386   | 3.0                   | 43.7                          | 28.3                   | 35.6 | 7.3 | -34.6                 | 0.0                            | 0.0   | 51.9         | 36.5   | 74            | 54         | -22.1                                      | -17.5   | Y           |  |  |
| 9.848   | 3.0                   | 36.7                          | 23.8                   | 37.6 | 8.7 | -35.1                 | 0.0                            | 0.0   | 47.8         | 35.0   | 74            | 54         | -26.2                                      | -19.0   | Noise Floor |  |  |
| 4.924   | 3.0                   | 43.5                          | 29.0                   | 32.7 | 5.9 | -34.9                 | 0.0                            | 0.0   | 47.3         | 32.8   | 74            | 54         | -26.7                                      | -21.2   | H           |  |  |
| 7.386   | 3.0                   | 39.7                          | 27.4                   | 35.6 | 7.3 | -34.6                 | 0.0                            | 0.0   | 48.0         | 35.6   | 74            | 54         | -26.0                                      | -18.4   | H           |  |  |
| 9.848   | 3.0                   | 36.3                          | 23.9                   | 37.6 | 8.7 | -35.1                 | 0.0                            | 0.0   | 47.5         | 35.1   | 74            | 54         | -26.5                                      | -18.9   | Noise Floor |  |  |
| No other emissions above noise floor.                 |                       |                               |                        |      |     |                       |                                |       |              |        |               |            |  |         |             |  |  |
| Rev. 11.10.08   |                       |                               |                        |      |     |                       |                                |       |              |        |               |            |  |         |             |  |  |
| 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               |       |              |        |               |            |  |         |             |  |  |

### 8.1.4. RECEIVER ABOVE 1 GHz FOR 20 MHz BANDWIDTH IN THE 2.4 GHz BAND

**High Frequency Measurement**  
 Compliance Certification Services, Fremont 5m Chamber

Company: SONY  
 Project #: 10J13147  
 Date: 4/7/10  
 Test Engineer: Thanh Nguyen  
 Configuration: EUT, Test JIG, Support Laptop  
 Mode: Receive

**Test Equipment:**

|                     |                             |                              |                        |              |
|---------------------|-----------------------------|------------------------------|------------------------|--------------|
| <b>Horn 1-18GHz</b> | <b>Pre-amplifer 1-26GHz</b> | <b>Pre-amplifer 26-40GHz</b> | <b>Horn &gt; 18GHz</b> | <b>Limit</b> |
| T60; S/N: 2238 @3m  | T145 Agilent 3008A0056      |                              |                        | RX RSS 210   |

Hi Frequency Cables

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

| f GHz                                 | Dist (m) | Read Pk dBuV | Read Avg dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Ftr dB | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes (V/H) |
|---------------------------------------|----------|--------------|---------------|---------|-------|--------|-----------|--------|-------------|------------|---------------|----------------|-----------|------------|-------------|
| <b>Low Ch</b>                         |          |              |               |         |       |        |           |        |             |            |               |                |           |            |             |
| 1.330                                 | 3.0      | 59.6         | 52.6          | 25.6    | 2.7   | -35.9  | 0.0       | 0.0    | 52.0        | 45.0       | 74            | 54             | -22.0     | -9.0       | V           |
| 1.995                                 | 3.0      | 55.4         | 47.1          | 27.8    | 3.5   | -35.4  | 0.0       | 0.0    | 51.2        | 42.9       | 74            | 54             | -22.8     | -11.1      | V           |
| 2.490                                 | 3.0      | 53.3         | 42.8          | 28.3    | 3.9   | -35.1  | 0.0       | 0.0    | 50.4        | 39.9       | 74            | 54             | -23.6     | -14.1      | V           |
| 1.200                                 | 3.0      | 58.9         | 46.7          | 25.1    | 2.6   | -36.0  | 0.0       | 0.0    | 50.6        | 38.4       | 74            | 54             | -23.4     | -15.6      | H           |
| 1.660                                 | 3.0      | 55.8         | 44.6          | 26.7    | 3.1   | -35.7  | 0.0       | 0.0    | 49.9        | 38.7       | 74            | 54             | -24.1     | -15.3      | H           |
| 1.993                                 | 3.0      | 49.1         | 39.6          | 27.8    | 3.5   | -35.4  | 0.0       | 0.0    | 44.9        | 35.4       | 74            | 54             | -29.1     | -18.6      | H           |
| <b>Mid Ch</b>                         |          |              |               |         |       |        |           |        |             |            |               |                |           |            |             |
| 1.327                                 | 3.0      | 59.0         | 52.1          | 25.6    | 2.7   | -35.9  | 0.0       | 0.0    | 51.4        | 44.5       | 74            | 54             | -22.6     | -9.5       | V           |
| 1.660                                 | 3.0      | 56.2         | 48.3          | 26.7    | 3.1   | -35.7  | 0.0       | 0.0    | 50.3        | 42.4       | 74            | 54             | -23.7     | -11.6      | V           |
| 1.993                                 | 3.0      | 56.1         | 46.8          | 27.8    | 3.5   | -35.4  | 0.0       | 0.0    | 51.9        | 42.6       | 74            | 54             | -22.1     | -11.4      | V           |
| 2.493                                 | 3.0      | 51.6         | 40.0          | 28.3    | 3.9   | -35.1  | 0.0       | 0.0    | 48.7        | 37.1       | 74            | 54             | -25.3     | -16.9      | V           |
| 1.201                                 | 3.0      | 60.3         | 47.2          | 25.1    | 2.6   | -36.0  | 0.0       | 0.0    | 52.0        | 38.9       | 74            | 54             | -22.0     | -15.1      | H           |
| 1.660                                 | 3.0      | 50.2         | 32.2          | 26.7    | 3.1   | -35.7  | 0.0       | 0.0    | 44.4        | 26.4       | 74            | 54             | -29.6     | -27.6      | H           |
| 1.996                                 | 3.0      | 49.0         | 37.3          | 27.8    | 3.5   | -35.4  | 0.0       | 0.0    | 44.8        | 33.1       | 74            | 54             | -29.2     | -20.9      | H           |
| <b>High Ch</b>                        |          |              |               |         |       |        |           |        |             |            |               |                |           |            |             |
| 1.330                                 | 3.0      | 58.7         | 48.9          | 25.6    | 2.7   | -35.9  | 0.0       | 0.0    | 51.1        | 41.3       | 74            | 54             | -22.9     | -12.7      | V           |
| 1.695                                 | 3.0      | 56.1         | 44.7          | 26.8    | 3.1   | -35.6  | 0.0       | 0.0    | 50.4        | 39.0       | 74            | 54             | -23.6     | -15.0      | V           |
| 1.997                                 | 3.0      | 55.3         | 47.7          | 27.8    | 3.5   | -35.4  | 0.0       | 0.0    | 51.2        | 43.5       | 74            | 54             | -22.8     | -10.5      | V           |
| 2.497                                 | 3.0      | 53.3         | 42.3          | 28.3    | 3.9   | -35.1  | 0.0       | 0.0    | 50.4        | 39.4       | 74            | 54             | -23.6     | -14.6      | V           |
| 1.200                                 | 3.0      | 59.4         | 47.0          | 25.1    | 2.6   | -36.0  | 0.0       | 0.0    | 51.2        | 38.7       | 74            | 54             | -22.8     | -15.3      | H           |
| 1.660                                 | 3.0      | 56.3         | 47.2          | 26.7    | 3.1   | -35.7  | 0.0       | 0.0    | 50.4        | 41.3       | 74            | 54             | -23.6     | -12.7      | H           |
| No other emissions above noise floor. |          |              |               |         |       |        |           |        |             |            |               |                |           |            |             |

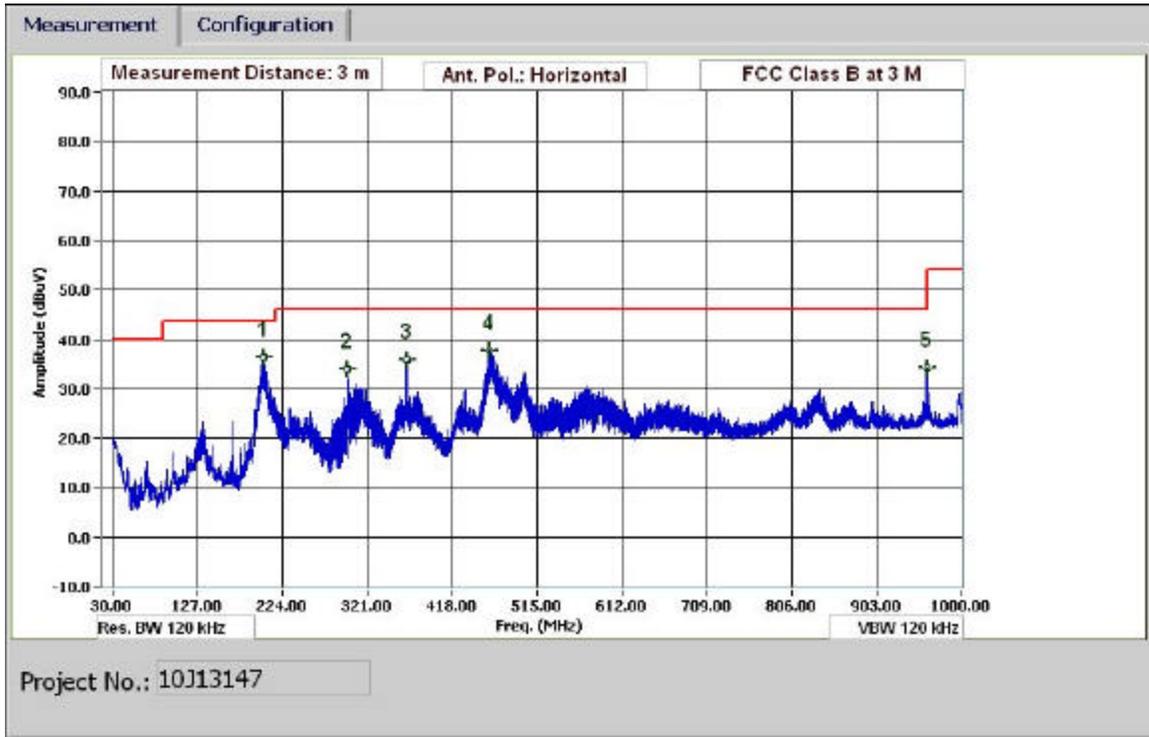
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|      |                       |        |                                |         |                              |
|------|-----------------------|--------|--------------------------------|---------|------------------------------|
| f    | Measurement 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               |         |                              |

## 8.2. WORST-CASE BELOW 1 GHz

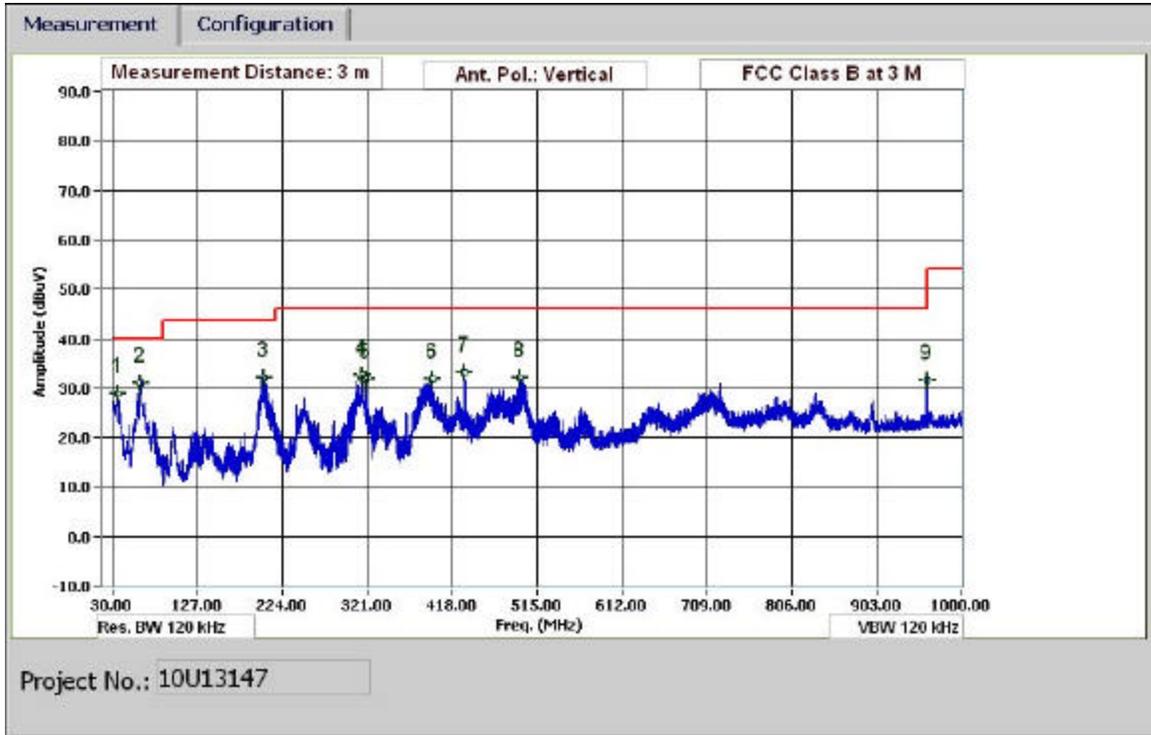
### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

VERTICAL PLOT



**DATA**

30-1000MHz Frequency Measurement  
 Compliance Certification Services, Fremont 5m Chamber

Test Engr: Thanh Nguyen  
 Date: 02/12/09  
 Project #: 10U13147  
 Company: Sony  
 EUT Description: 802.11 bgn WLAN module  
 EUT M/N: DWM-W038  
 Test Target: FCC 15.247  
 Mode Oper: Transmit worst case

f Measurement Frequency Amp Preamp Gain Margin Margin vs. Limit  
 Dist Distance to Antenna D Corr Distance Correct to 3 meters  
 Read Analyzer Reading Filter Filter Insert Loss  
 AF Antenna Factor Corr Calculated Field Strength  
 CL Cable Loss Limit Field Strength Limit

| f<br>MHz             | Dist<br>(m) | Read<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | Filter<br>dB | Corr.<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Ant. Pol<br>V/H | Det.<br>P/A/QP | Ant. High<br>cm | Table Angle<br>Degree | Notes |
|----------------------|-------------|--------------|------------|----------|-----------|--------------|--------------|-----------------|-----------------|--------------|-----------------|----------------|-----------------|-----------------------|-------|
| <b>Tx Worst case</b> |             |              |            |          |           |              |              |                 |                 |              |                 |                |                 |                       |       |
| <b>Full scan</b>     |             |              |            |          |           |              |              |                 |                 |              |                 |                |                 |                       |       |
| 36.120               | 3.0         | 40.9         | 17.2       | 0.5      | 29.6      | 0.0          | 0.0          | 29.0            | 40.0            | -11.0        | V               | P              | 100.0           | 0 - 360               |       |
| 62.401               | 3.0         | 51.9         | 8.0        | 0.7      | 29.6      | 0.0          | 0.0          | 30.9            | 40.0            | -9.1         | V               | P              | 100.0           | 0 - 360               |       |
| 202.687              | 3.0         | 47.8         | 12.0       | 1.3      | 28.9      | 0.0          | 0.0          | 32.2            | 43.5            | -11.3        | V               | P              | 100.0           | 0 - 360               |       |
| 314.892              | 3.0         | 46.2         | 13.5       | 1.6      | 28.9      | 0.0          | 0.0          | 32.6            | 46.0            | -13.4        | V               | P              | 100.0           | 0 - 360               |       |
| 320.052              | 3.0         | 45.4         | 13.6       | 1.7      | 28.9      | 0.0          | 0.0          | 31.8            | 46.0            | -14.2        | V               | P              | 100.0           | 0 - 360               |       |
| 394.935              | 3.0         | 44.2         | 14.9       | 1.9      | 29.3      | 0.0          | 0.0          | 31.7            | 46.0            | -14.3        | V               | P              | 100.0           | 0 - 360               |       |
| 432.017              | 3.0         | 45.1         | 15.6       | 2.0      | 29.4      | 0.0          | 0.0          | 33.2            | 46.0            | -12.8        | V               | P              | 100.0           | 0 - 360               |       |
| 495.499              | 3.0         | 42.9         | 16.7       | 2.1      | 29.7      | 0.0          | 0.0          | 32.0            | 46.0            | -14.0        | V               | P              | 100.0           | 0 - 360               |       |
| 959.918              | 3.0         | 34.6         | 22.2       | 3.1      | 28.5      | 0.0          | 0.0          | 31.5            | 46.0            | -14.5        | V               | P              | 100.0           | 0 - 360               |       |
| 202.807              | 3.0         | 51.9         | 12.0       | 1.3      | 28.9      | 0.0          | 0.0          | 36.3            | 43.5            | -7.2         | H               | P              | 100.0           | 0 - 360               |       |
| 298.931              | 3.0         | 47.9         | 13.2       | 1.6      | 28.8      | 0.0          | 0.0          | 34.0            | 46.0            | -12.0        | H               | P              | 100.0           | 0 - 360               |       |
| 365.894              | 3.0         | 48.6         | 14.4       | 1.8      | 29.1      | 0.0          | 0.0          | 35.7            | 46.0            | -10.3        | H               | P              | 100.0           | 0 - 360               |       |
| 460.578              | 3.0         | 49.2         | 16.1       | 2.0      | 29.6      | 0.0          | 0.0          | 37.8            | 46.0            | -8.2         | H               | P              | 100.0           | 0 - 360               |       |
| 960.038              | 3.0         | 37.4         | 22.2       | 3.1      | 28.5      | 0.0          | 0.0          | 34.2            | 54.0            | -19.8        | H               | P              | 100.0           | 0 - 360               |       |

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

## 9. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

| 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

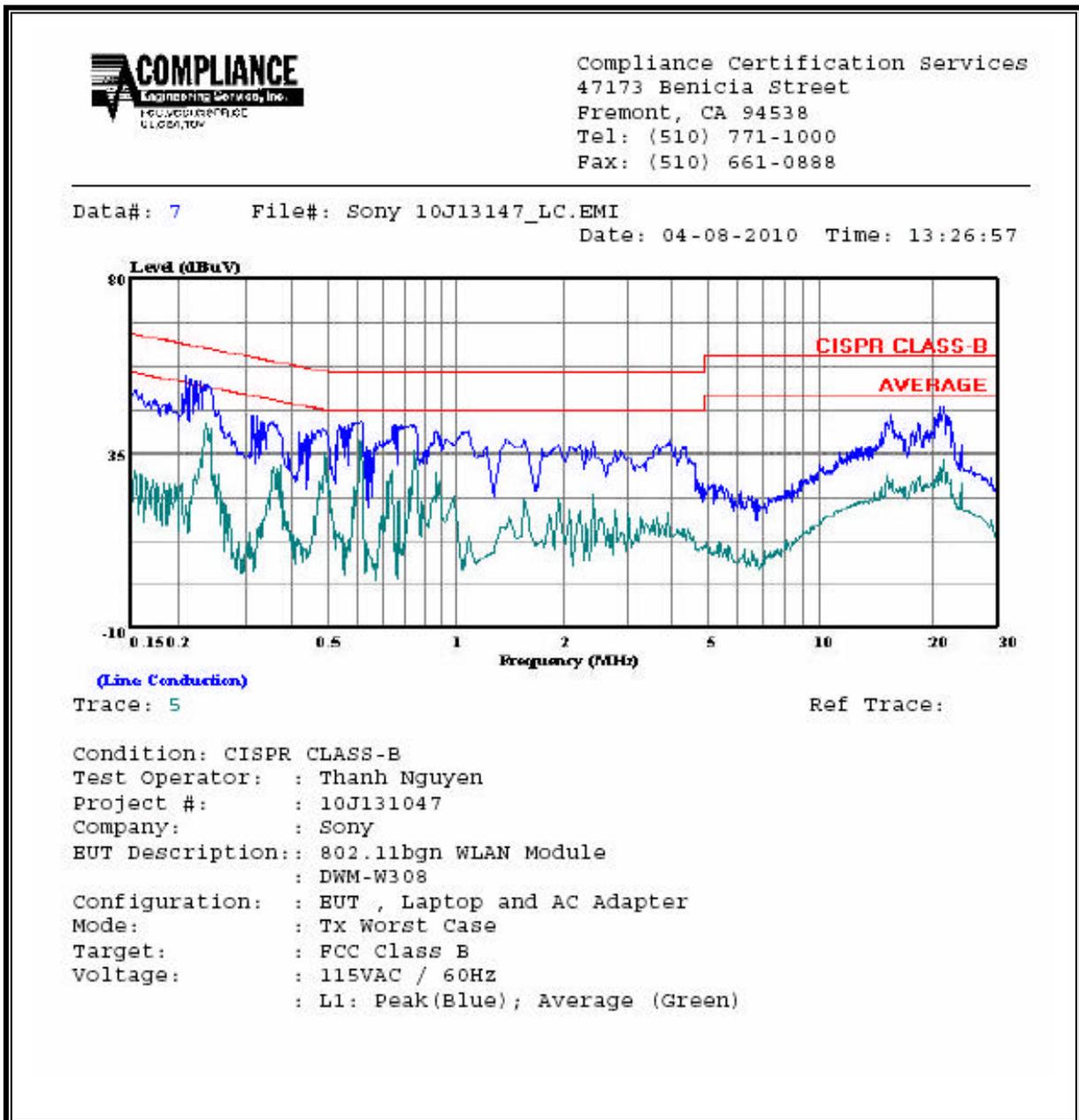
ANSI C63.4

### RESULTS

#### 6 WORST EMISSIONS

| CONDUCTED EMISSIONS DATA (115VAC 60Hz) |           |           |           |       |       |       |         |         |         |
|--|-----------|-----------|-----------|-------|-------|-------|---------|---------|---------|
| Freq.                                  | Reading   |           |           | Cross | Limit | EN B  | Margin  |         | Remark  |
| (MHz)                                  | PK (dBuV) | QP (dBuV) | AV (dBuV) | (dB)  | QP    | AV    | QP (dB) | AV (dB) | L1 / L2 |
| 0.21                                   | 55.06     | --        | 42.24     | 0.00  | 63.24 | 53.24 | -8.18   | -11.00  | L1      |
| 0.61                                   | 43.29     | --        | 37.94     | 0.00  | 56.00 | 46.00 | -12.71  | -8.06   | L1      |
| 21.49                                  | 46.60     | --        | 33.60     | 0.00  | 60.00 | 50.00 | -13.40  | -16.40  | L1      |
| 0.21                                   | 54.30     | --        | 42.40     | 0.00  | 63.05 | 53.05 | -8.75   | -10.65  | L2      |
| 0.74                                   | 42.12     | --        | 33.83     | 0.00  | 56.00 | 46.00 | -13.88  | -12.17  | L2      |
| 21.60                                  | 45.61     | --        | 31.73     | 0.00  | 60.00 | 50.00 | -14.39  | -18.27  | L2      |
| 6 Worst Data                           |           |           |           |       |       |       |         |         |         |

**LINE 1 RESULTS**

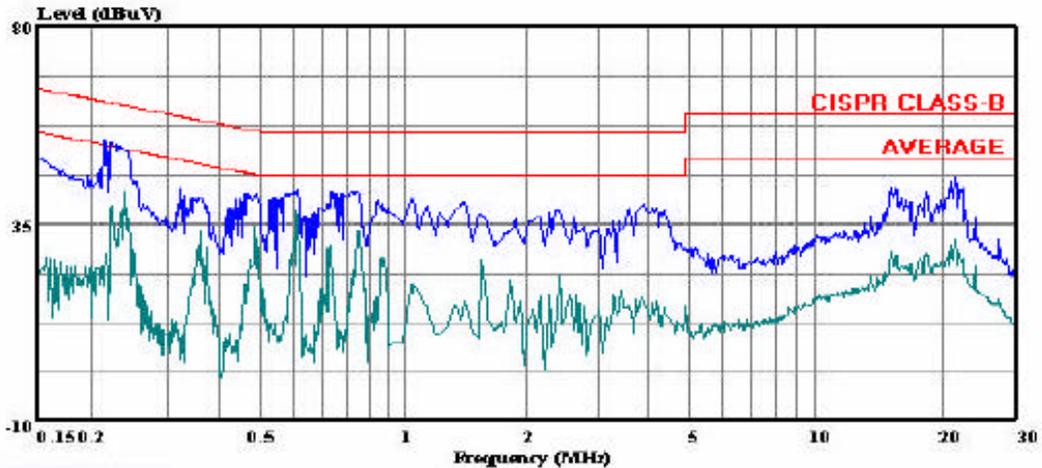


**LINE 2 RESULTS**



Compliance Certification Services  
47173 Benicia Street  
Fremont, CA 94538  
Tel: (510) 771-1000  
Fax: (510) 661-0888

Data#: 21 File#: Sony 10J13147\_LC.EMI Date: 04-08-2010 Time: 14:00:16



(Line Conduction)

Trace: 19

Ref Trace:

Condition: CISPR CLASS-B  
Test Operator: : Thanh Nguyen  
Project #: : 10J131047  
Company: : Sony  
BUT Description: : 802.11bgn WLAN Module  
: DWM-W308  
Configuration: : BUT , Laptop and AC Adapter  
Mode: : Tx Worst Case  
Target: : FCC Class B  
Voltage: : 115VAC / 60HZ  
: L2: Peak(Blue); Average (Green)

## 10. MAXIMUM PERMISSIBLE EXPOSURE

### FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency range (MHz)                                   | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm <sup>2</sup> ) | Averaging time (minutes) |
|---|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| (A) Limits for Occupational/Controlled Exposures        |                               |                               |                                     |                          |
| 0.3–3.0 .....   | 614                           | 1.63                          | *(100)                              | 6                        |
| 3.0–30 .....  | 1842/f                        | 4.89/f                        | *(900/f <sup>2</sup> )              | 6                        |
| 30–300 .....  | 61.4                          | 0.163                         | 1.0                                 | 6                        |
| 300–1500 .....  | .....                         | .....                         | f/300                               | 6                        |
| 1500–100,000 .....                                      | .....                         | .....                         | 5                                   | 6                        |
| (B) Limits for General Population/Uncontrolled Exposure |                               |                               |                                     |                          |
| 0.3–1.34 .....  | 614                           | 1.63                          | *(100)                              | 30                       |
| 1.34–30 .....   | 824/f                         | 2.19/f                        | *(180/f <sup>2</sup> )              | 30                       |

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm <sup>2</sup> ) | Averaging time (minutes) |
|-----------------------|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| 30–300 .....          | 27.5                          | 0.073                         | 0.2                                 | 30                       |
| 300–1500 .....        | .....                         | .....                         | f/1500                              | 30                       |
| 1500–100,000 .....    | .....                         | .....                         | 1.0                                 | 30                       |

f = frequency in MHz

\* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

**EQUATIONS**

Power density is given by:

$$S = \text{EIRP} / (4 * \text{Pi} * \text{D}^2)$$

where

- S = Power density in W/m<sup>2</sup>
- EIRP = Equivalent Isotropic Radiated Power in W
- D = Separation distance in m

Power density in units of W/m<sup>2</sup> is converted to units of mW/cm<sup>2</sup> by dividing by 10.

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

**LIMITS**

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm<sup>2</sup>

**RESULTS**

| Band    | Mode   | Separation Distance (m) | Output Power (dBm) | Antenna Gain (dBi) | IC Power Density (W/m <sup>2</sup> ) | FCC Power Density (mW/cm <sup>2</sup> ) |
|---------|--------|-------------------------|--------------------|--------------------|--------------------------------------|---|
| 2.4 GHz | b mode | 0.20                    | 17.43              | 0.33               | 0.12                                 | 0.012                                   |
| 2.4 GHz | g mode | 0.20                    | 22.37              | 0.33               | 0.37                                 | 0.037                                   |
| 2.4 GHz | HT20   | 0.20                    | 23.64              | 0.33               | 0.50                                 | 0.050                                   |