



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

**CERTIFICATION TEST REPORT**

**FOR**

**2.4 GHZ TRANSCEIVER**

**MODEL NUMBER: A8520E24A91**

**FCC ID: X7J-A10051701  
IC: 8975A-A10051701**

**REPORT NUMBER: 10U13533-1, Revision A**

**ISSUE DATE: DECEMBER 21, 2010**

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*Prepared by*  
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**NVLAP LAB CODE 200065-0**

Revision History

| <u>Rev.</u> | <u>Issue Date</u> | <u>Revisions</u>    | <u>Revised By</u> |
|-------------|-------------------|---------------------|-------------------|
| ---         | 12/06/10          | Initial Issue       | T. Chan           |
| A           | 12/21/10          | Updated IC Standard | A. Zaffar         |

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** ANAREN, INC  
6635 KIRKVILLE ROAD  
EAST SYRACUSE, NY, 13057, U.S.A.

**EUT DESCRIPTION:** 2.4 GHZ TRANSCEIVER

**MODEL:** A8520E24A91

**SERIAL NUMBER:** 51048 (RADIATED) & 91048 (CONDUCTED)

**DATE TESTED:** DECEMBER 04, 2010

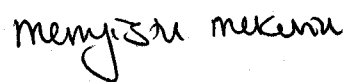
| APPLICABLE STANDARDS                    |              |
|---|--------------|
| STANDARD                                | TEST RESULTS |
| CFR 47 Part 15 Subpart C                | Pass         |
| INDUSTRY CANADA RSS-210 Issue 8 Annex 8 | Pass         |
| INDUSTRY CANADA RSS-GEN Issue 3         |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

Compliance Certification Services, Inc. (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

Tested By:



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THU CHAN  
ENGINEERING MANAGER  
UL CCS

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MENGISTU MEKURIA  
EMC ENGINEER  
UL CCS

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

## 3. FACILITIES AND ACCREDITATION

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

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

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER                             | UNCERTAINTY |
|---------------------------------------|-------------|
| Conducted Disturbance, 0.15 to 30 MHz | 3.52 dB     |
| Radiated Disturbance, 30 to 1000 MHz  | 4.94 dB     |

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a 2.4 GHz Transceiver that is manufactured by Anaren, Inc.

### 5.2. MAXIMUM OUTPUT POWER

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

| Frequency Range (MHz) | Mode | Modulation | Output Power (dBm) | Output Power (mW) |
|-----------------------|------|------------|--------------------|-------------------|
| 2406 - 2474           | DSSS | QPSK       | 13.91              | 24.60             |

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes PCB antenna with maximum peak gains of 2dBi.

### 5.4. SOFTWARE AND FIRMWARE

The EUT Firmware software installed during testing was v01.03

The test utility software used during testing was A85xx Test Console, V1.0.0.77.

### 5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as low channel with the highest output power.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

#### CONDUCTED TEST

| PERIPHERAL SUPPORT EQUIPMENT LIST |                   |                      |                              |        |
|-----------------------------------|-------------------|----------------------|------------------------------|--------|
| Description                       | Manufacturer      | Model                | Serial Number                | FCC ID |
| Laptop                            | Dell              | M4500                | 5Z2K2M1                      | DoC    |
| AC Adapter                        | Dell              | DA130PE1-00          | CN-07U012-48661-086-00EF-A04 | DoC    |
| USB/SPI Converter                 | Total Phase       | I <sup>2</sup> C/SPI | 2237-391864                  | DoC    |
| System JIG                        | Texas Instruments | TAS57XXEVM           | 1018002327                   | DoC    |

#### RADIATED TEST

| PERIPHERAL SUPPORT EQUIPMENT LIST |                   |                      |                        |        |
|-----------------------------------|-------------------|----------------------|------------------------|--------|
| Description                       | Manufacturer      | Model                | Serial Number          | FCC ID |
| Laptop                            | IBM               | T43                  | L3-BB983               | DoC    |
| AC Adapter                        | IBM               | 02K6810              | 11S02K6810Z123B7514164 | DoC    |
| USB/SPI Converter                 | Total Phase       | I <sup>2</sup> C/SPI | 2237-392328            | DoC    |
| System JIG                        | Texas Instruments | TAS57XXEVM           | 1018002406             | DoC    |

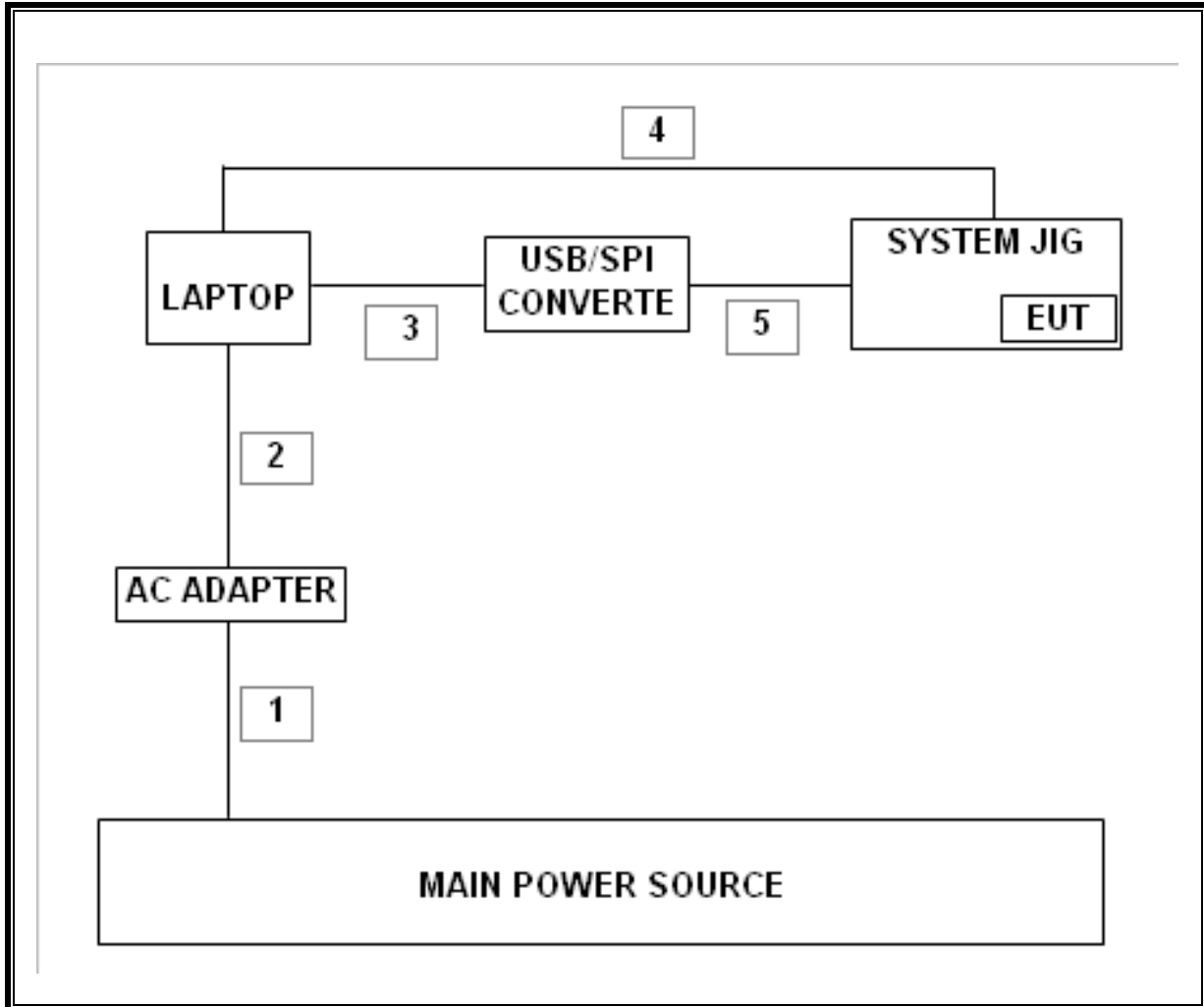
### I/O CABLES

| I/O CABLE LIST |      |                      |                |             |              |                    |
|----------------|------|----------------------|----------------|-------------|--------------|--------------------|
| Cable No.      | Port | # of Identical Ports | Connector Type | Cable Type  | Cable Length | Remarks            |
| 1              | AC   | 1                    | US 115V        | Un-shielded | 1.0m         | N/A                |
| 2              | DC   | 1                    | DC             | Un-shielded | 2.0m         | Ferrite at one End |
| 3              | USB  | 1                    | USB            | Un-shielded | 2.0m         | N/A                |
| 4              | USB  | 1                    | USB            | Un-shielded | 1.5m         | N/A                |
| 5              | Data | 1                    | 10 Pin         | Un-shielded | 0.2m         | N/A                |

### TEST SETUP

The EUT is connected to a host laptop computer via system test board during the tests. Test software exercised the radio card.

**SETUP DIAGRAM FOR TESTS**





## 6. TEST AND MEASUREMENT EQUIPMENT

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

| TEST EQUIPMENT LIST         |                |                  |        |          |
|-----------------------------|----------------|------------------|--------|----------|
| Description                 | Manufacturer   | Model            | Asset  | Cal Due  |
| Antenna, Bilog, 2 GHz       | Sunol Sciences | JB1              | C01011 | 07/12/11 |
| Antenna, Horn, 18 GHz       | EMCO           | 3115             | C00945 | 06/29/11 |
| Preamplifier, 1300 MHz      | Agilent / HP   | 8447D            | C00885 | 01/06/11 |
| Preamplifier, 26.5 GHz      | Agilent / HP   | 8449B            | C01052 | 07/14/11 |
| LISN, 10 kHz ~ 30 MHz       | Solar          | 8012-50-R-24-BNC | N02481 | 11/10/11 |
| Spectrum Analyzer, 44 GHz   | Agilent / HP   | E4446A           | C01012 | 09/03/11 |
| Spectrum Analyzer, 26.5 GHz | Agilent / HP   | E4440A           | C01179 | 08/18/11 |
| EMI Test Receiver, 30 MHz   | R & S          | ESHS 20          | N02396 | 05/06/11 |
| Reject Filter, 2.4-2.5 GHz  | Micro-Tronics  | BRC13192         | N02683 | CNR      |
| Peak Power Meter            | Boonton        | 4541             | C01186 | 03/01/11 |
| Peak Power Sensor           | Boonton        | 57318            | C01202 | 02/23/11 |

## 7. ANTENNA PORT TEST RESULTS

### 7.1.1. 6 dB BANDWIDTH

#### LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

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

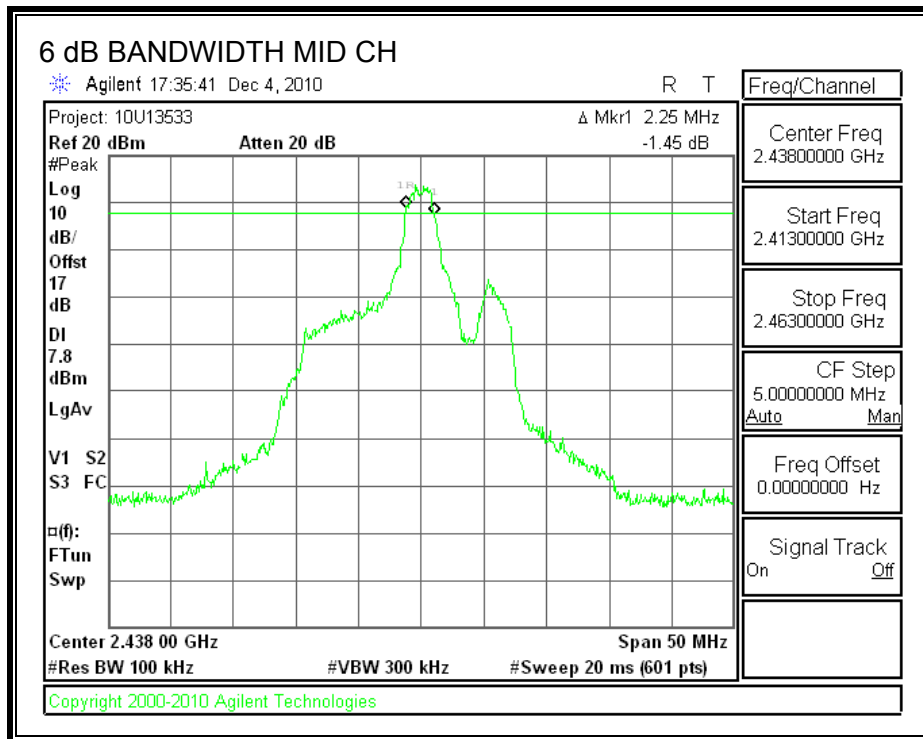
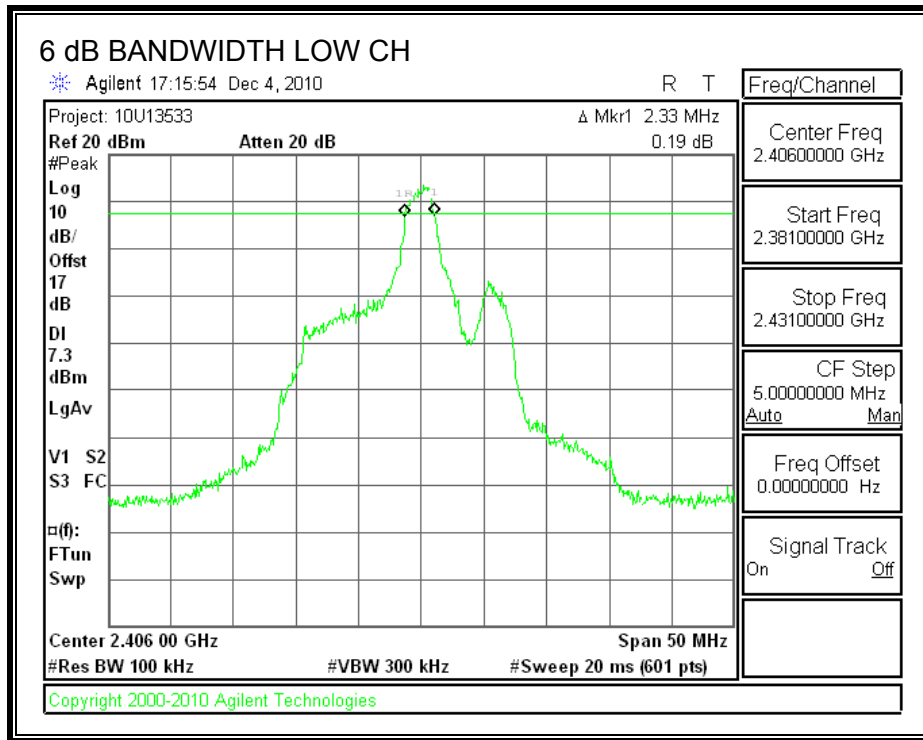
#### TEST PROCEDURE

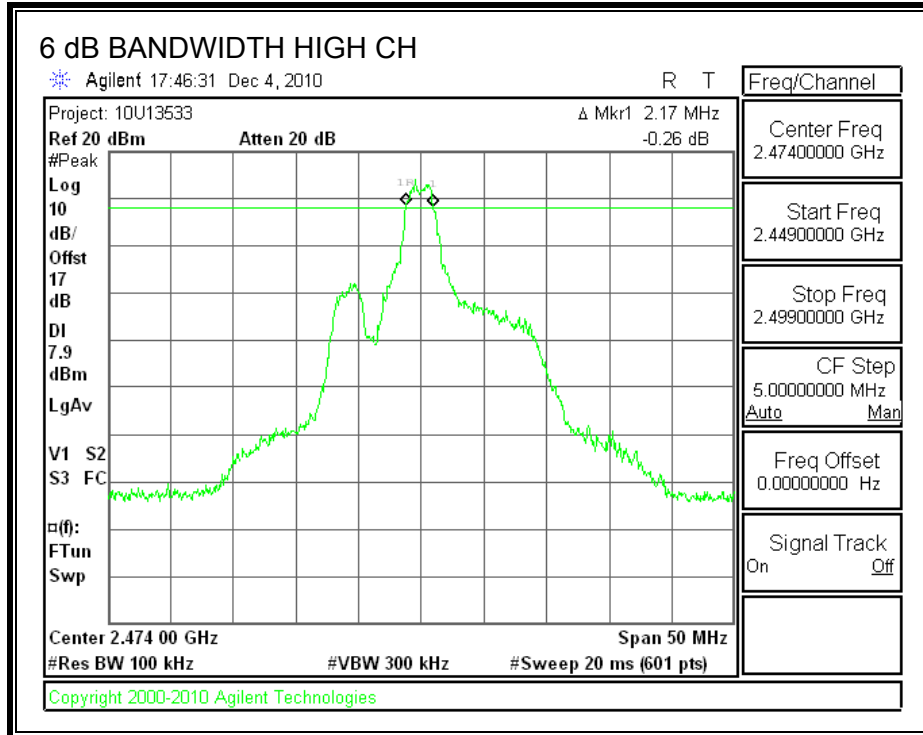
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

#### RESULTS

| Channel | Frequency<br>(MHz) | 6 dB Bandwidth<br>(KHz) | Minimum Limit<br>(MHz) |
|---------|--------------------|-------------------------|------------------------|
| Low     | 2406.0             | 2330.0                  | 0.5                    |
| Middle  | 2438.0             | 2250.0                  | 0.5                    |
| High    | 2474.0             | 2170.0                  | 0.5                    |

**6 dB BANDWIDTH**





## 7.1.2. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

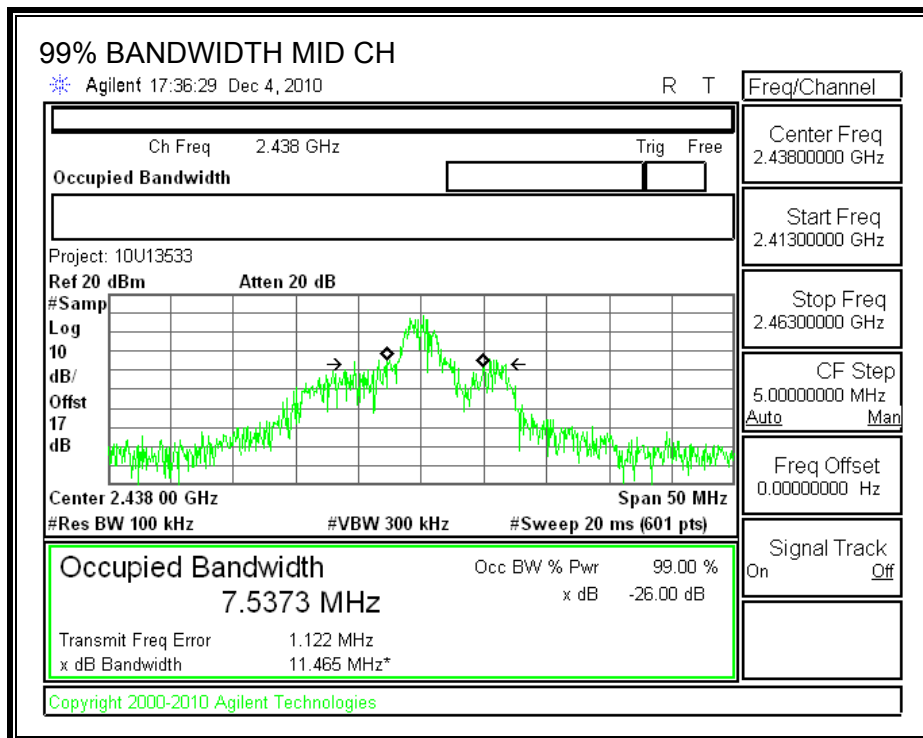
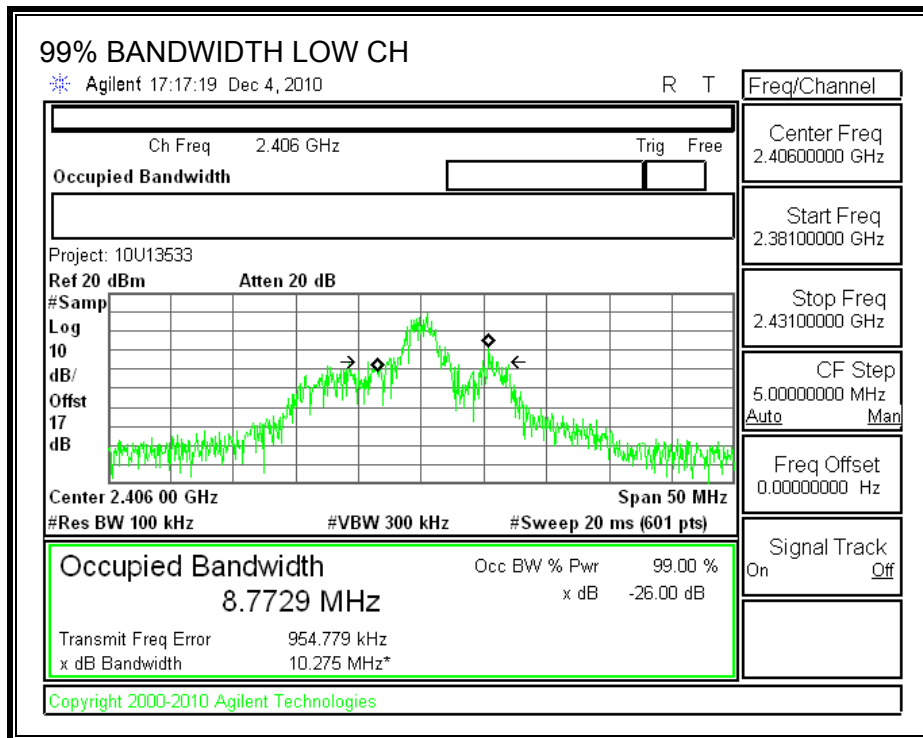
### TEST PROCEDURE

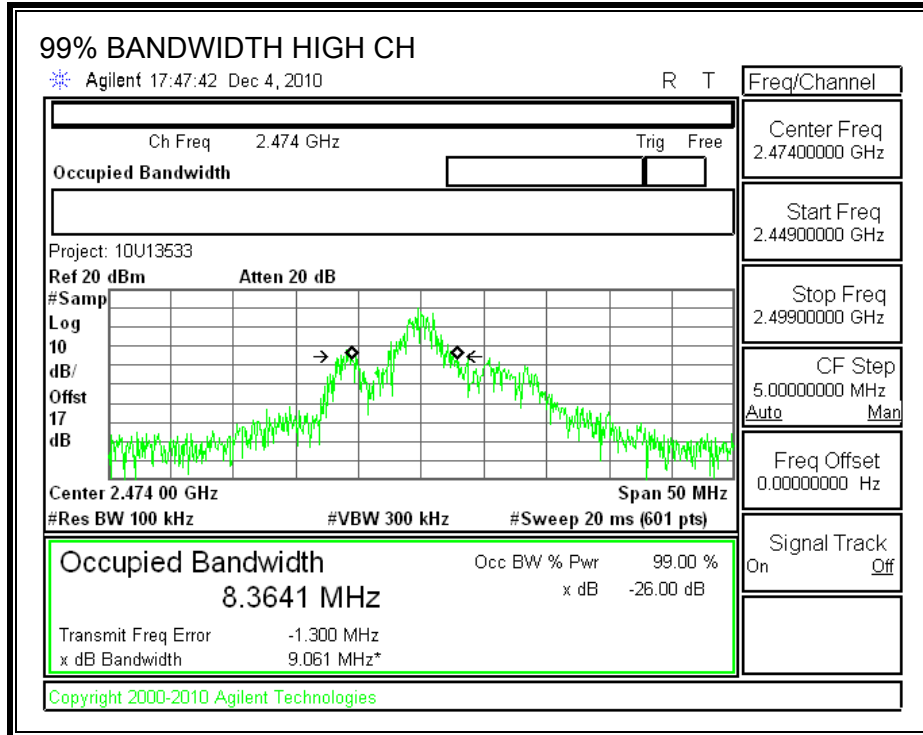
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

### RESULTS

| Channel | Frequency<br>(MHz) | 99% Bandwidth<br>(KHz) |
|---------|--------------------|------------------------|
| Low     | 2406.0             | 8772.9                 |
| Middle  | 2438.0             | 7537.3                 |
| High    | 2474.0             | 8364.1                 |

**99% BANDWIDTH**





### 7.1.3. OUTPUT POWER

#### LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

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

#### TEST PROCEDURE

Peak power is measured by the power meter.

#### RESULTS

| Channel | Frequency<br>(MHz) | Output<br>Power<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------|----------------|----------------|
| Low     | 2406.0             | 13.91                    | 30             | -16.09         |
| Middle  | 2438.0             | 13.75                    | 30             | -16.26         |
| High    | 2474.0             | 13.62                    | 30             | -16.38         |



### 7.1.4. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter output is connected to a power meter.

#### RESULTS

The cable assembly insertion loss of 17dB was entered as an offset in the power meter to allow for direct reading of power.

| Channel | Frequency (MHz) | Power (dBm) |
|---------|-----------------|-------------|
| Low     | 2406.0          | 13.333      |
| Middle  | 2438.0          | 13.184      |
| High    | 2474.0          | 13.008      |

### 7.1.5. POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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

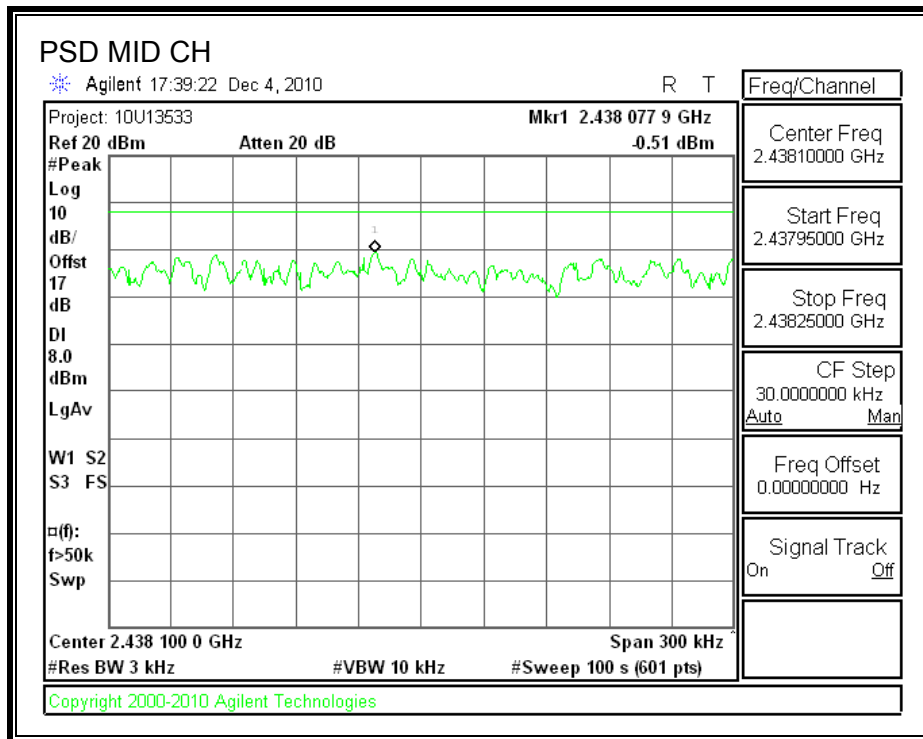
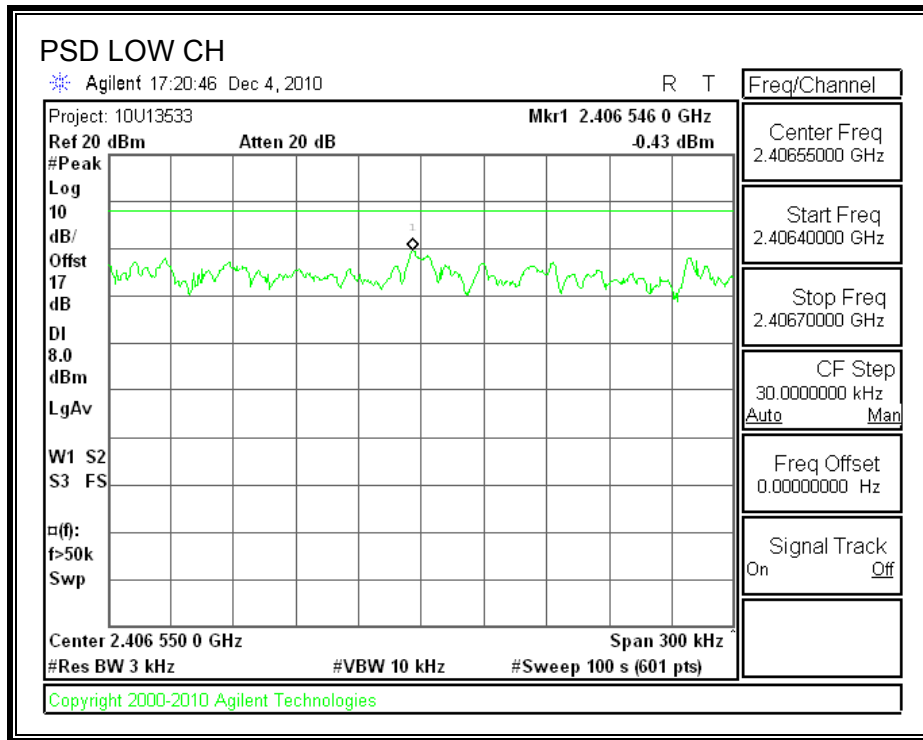
#### TEST PROCEDURE

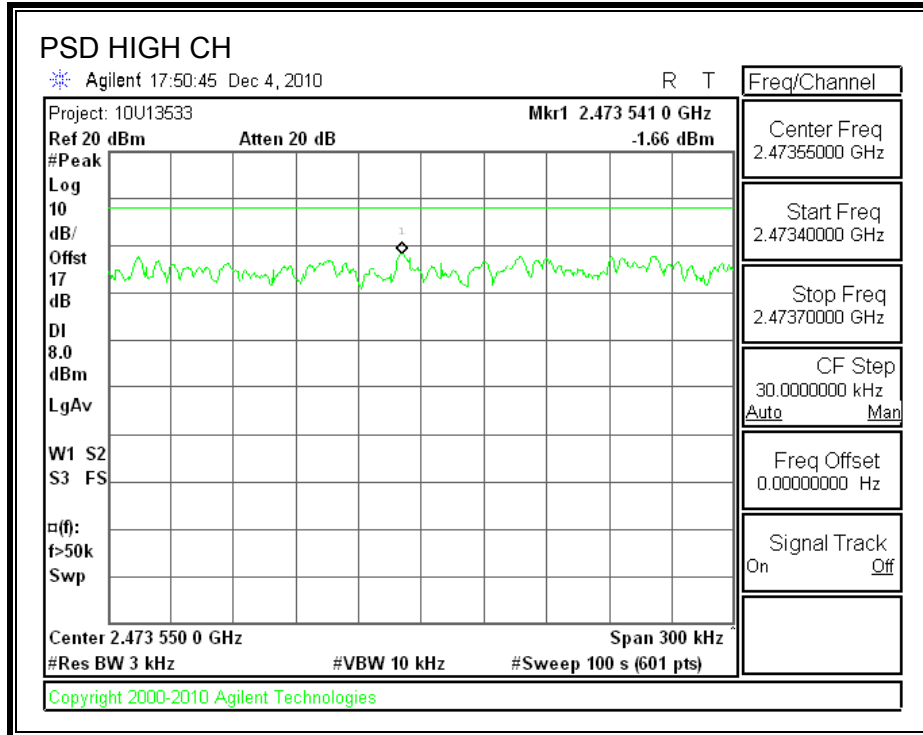
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

#### RESULTS

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Margin (dB) |
|---------|-----------------|------------|-------------|-------------|
| Low     | 2406.0          | -0.43      | 8           | -8.43       |
| Middle  | 2438.0          | -0.51      | 8           | -8.51       |
| High    | 2474.0          | -1.66      | 8           | -9.66       |

**POWER SPECTRAL DENSITY**





## **7.1.6. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

IC RSS-210 A8.5

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

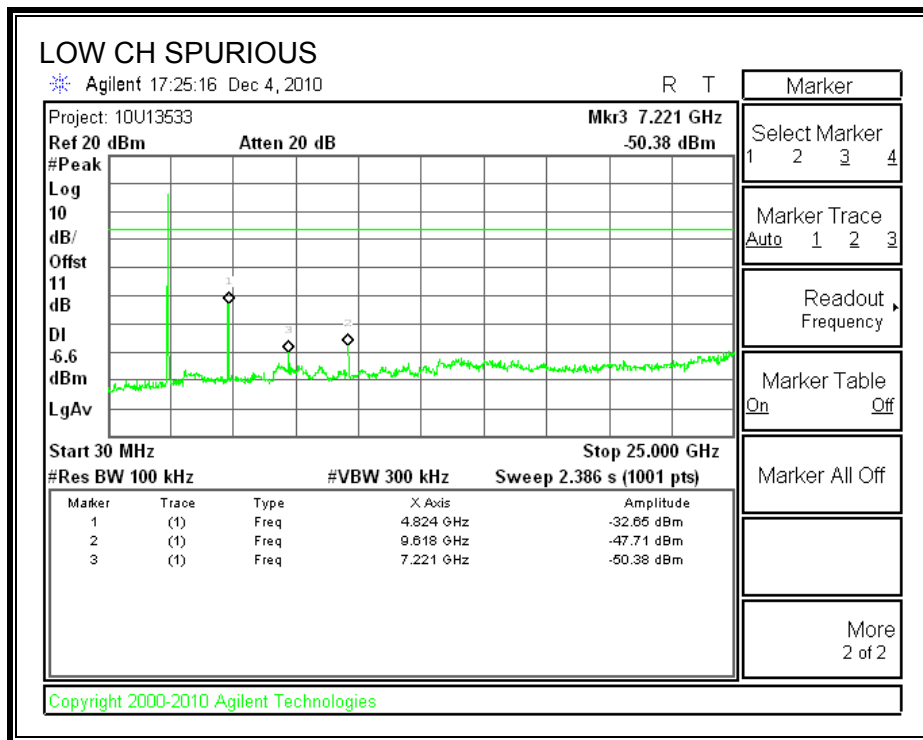
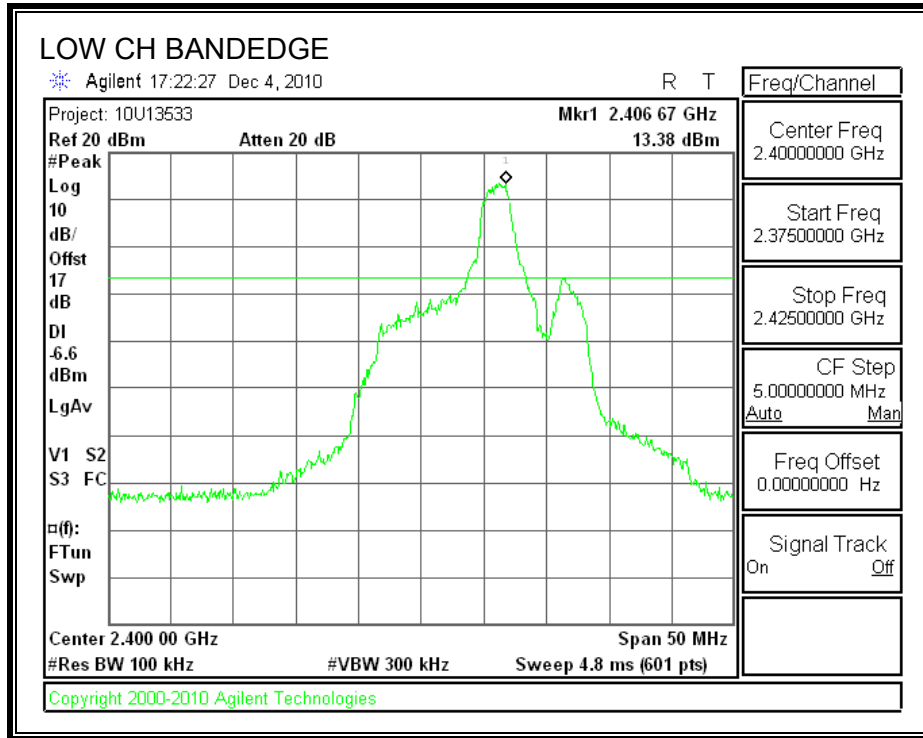
### **TEST PROCEDURE**

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

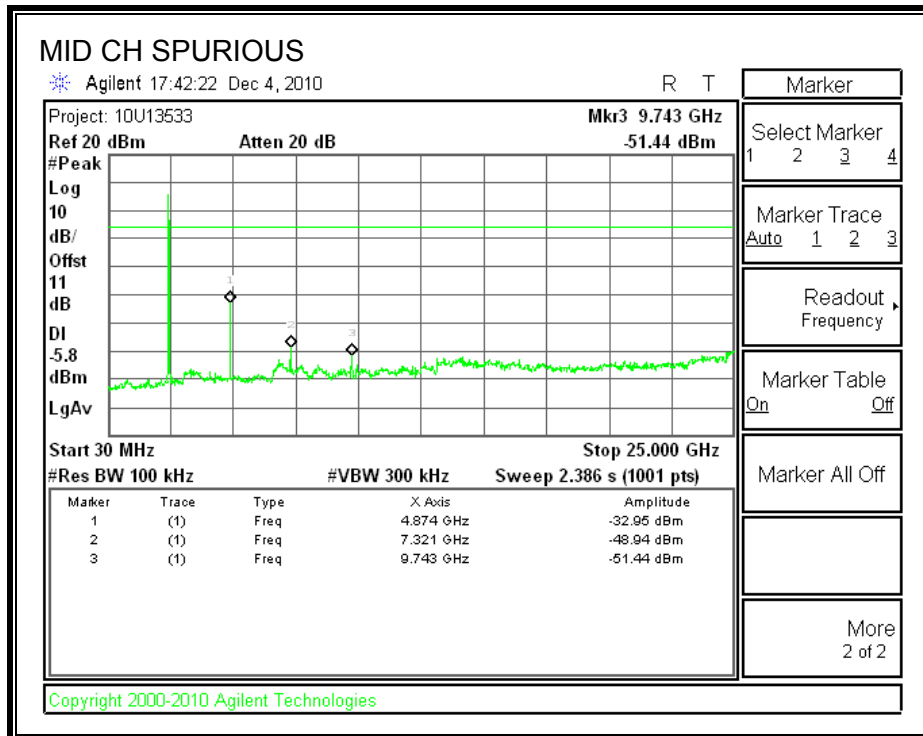
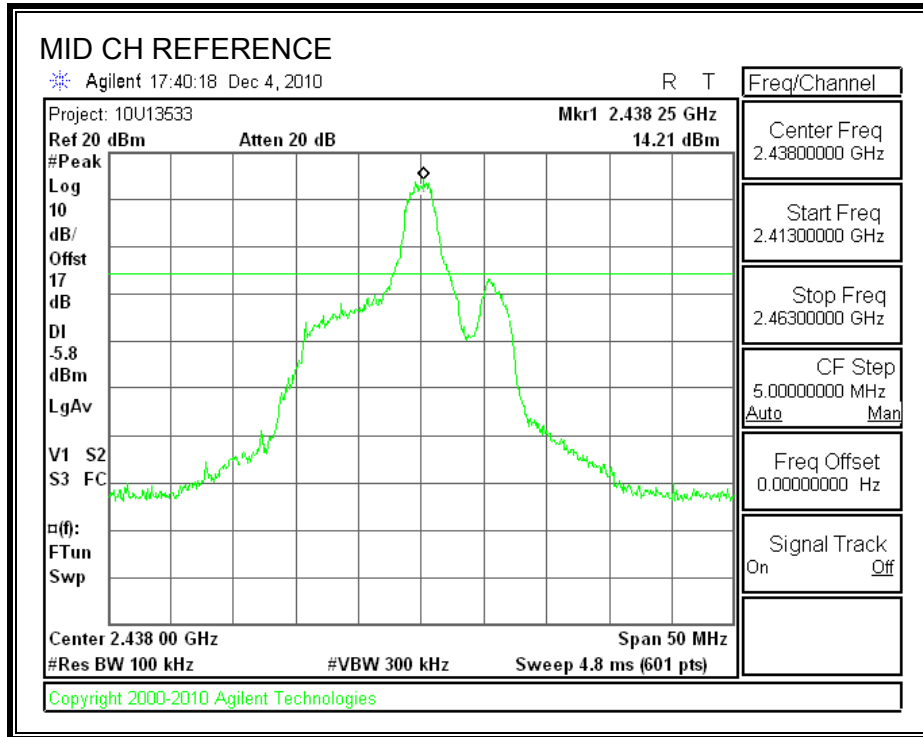
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

**RESULTS**

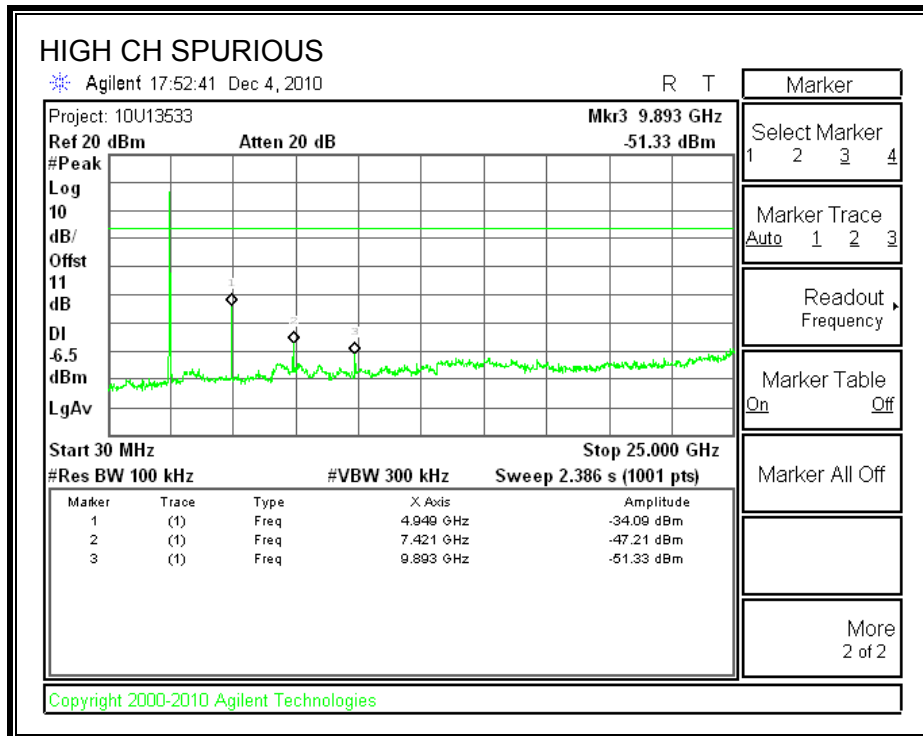
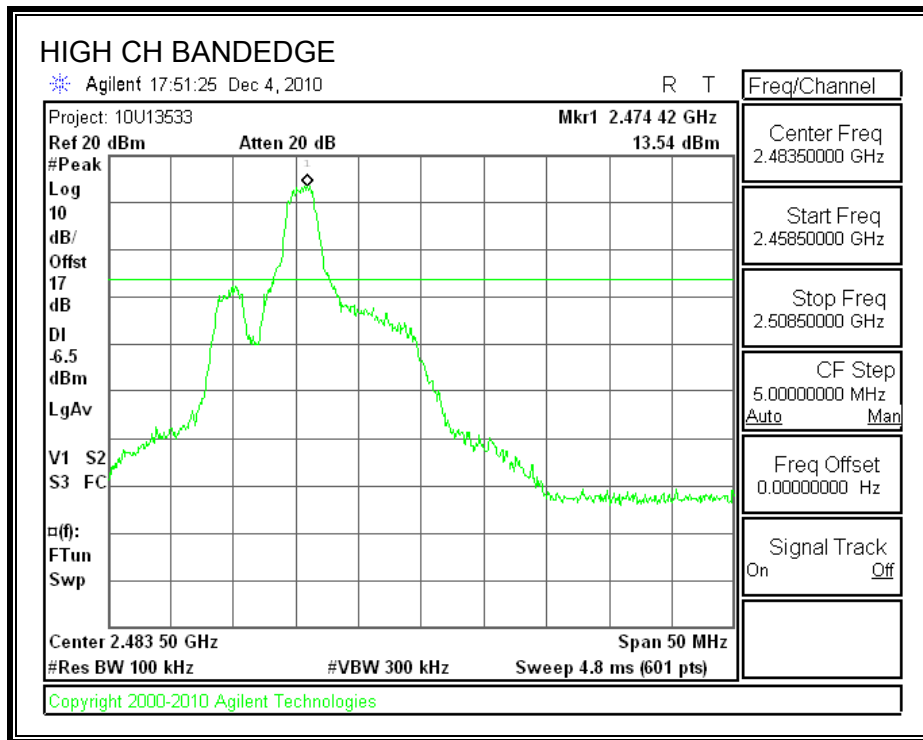
**SPURIOUS EMISSIONS, LOW CHANNEL**



**SPURIOUS EMISSIONS, MID CHANNEL**



**SPURIOUS EMISSIONS, HIGH CHANNEL**





## 8. RADIATED TEST RESULTS

### 8.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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

#### TEST PROCEDURE

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

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

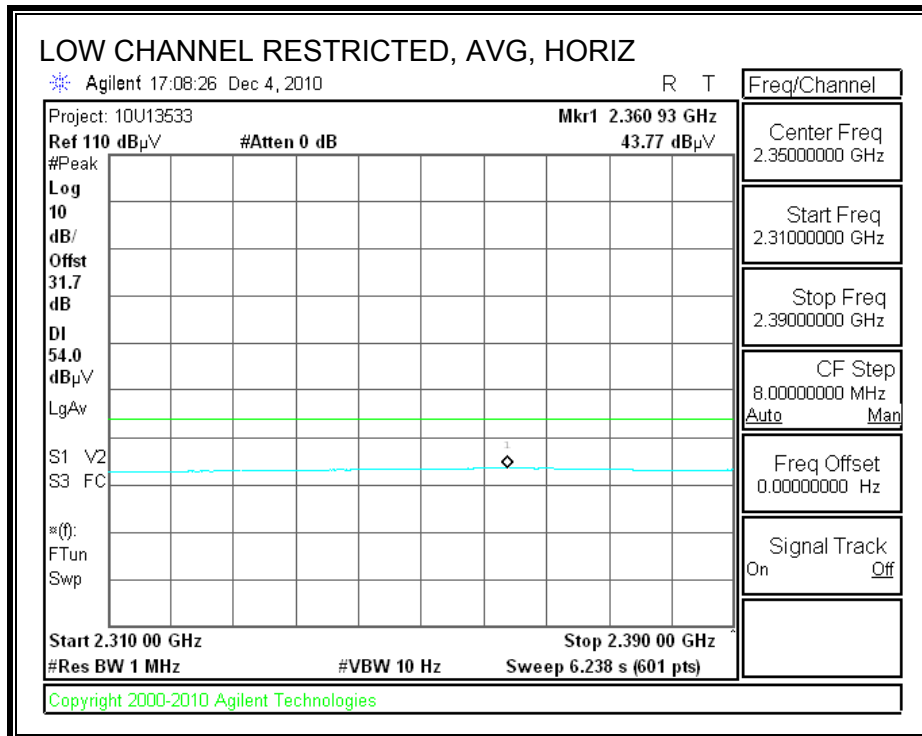
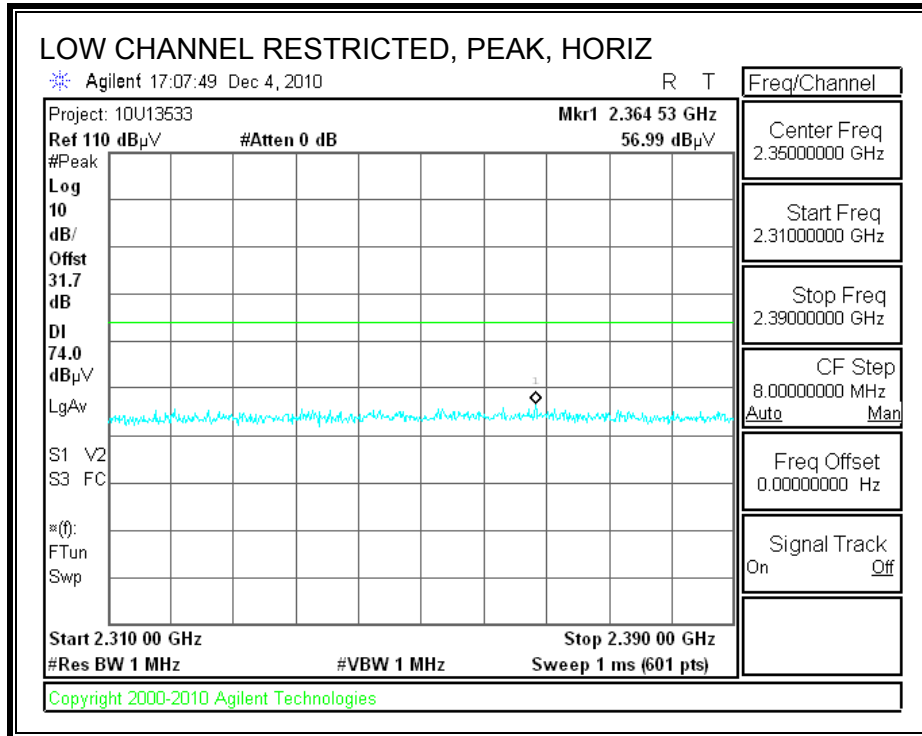
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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

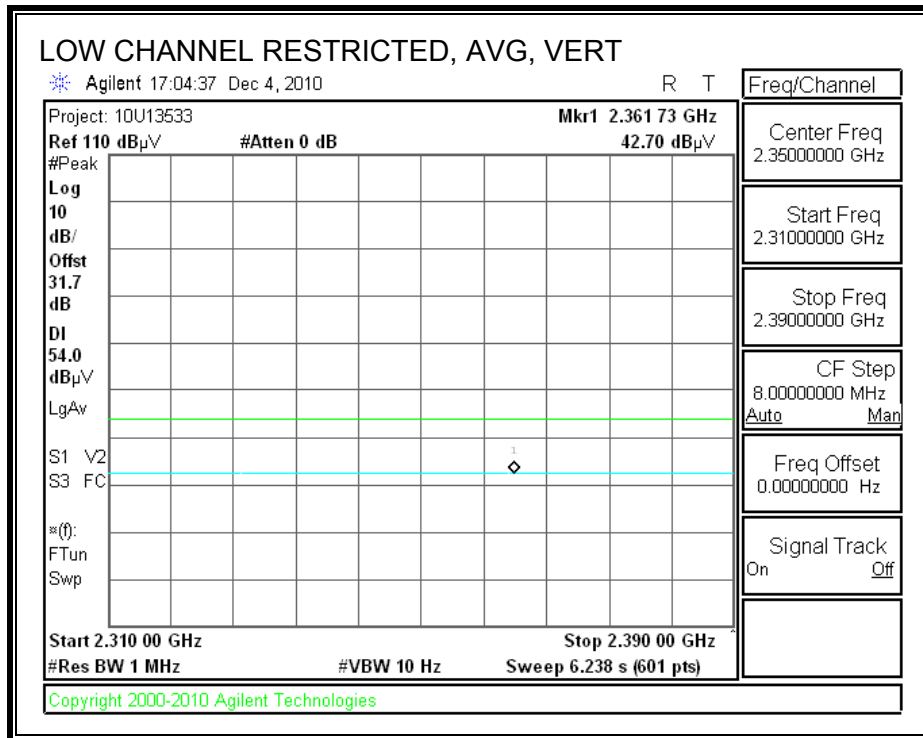
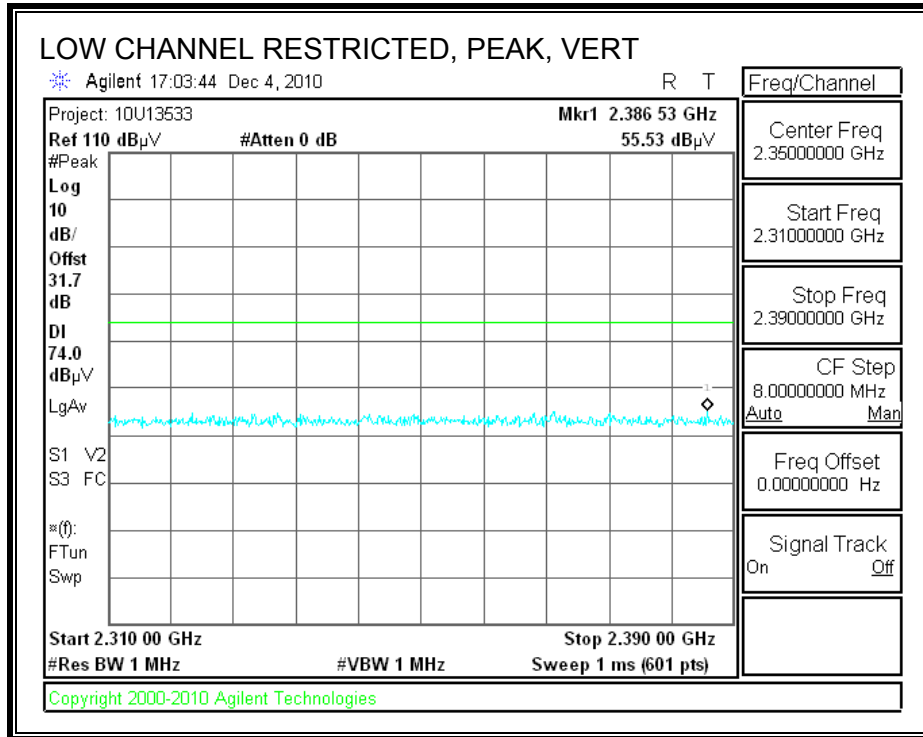
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

## 8.2. TRANSMITTER ABOVE 1 GHz

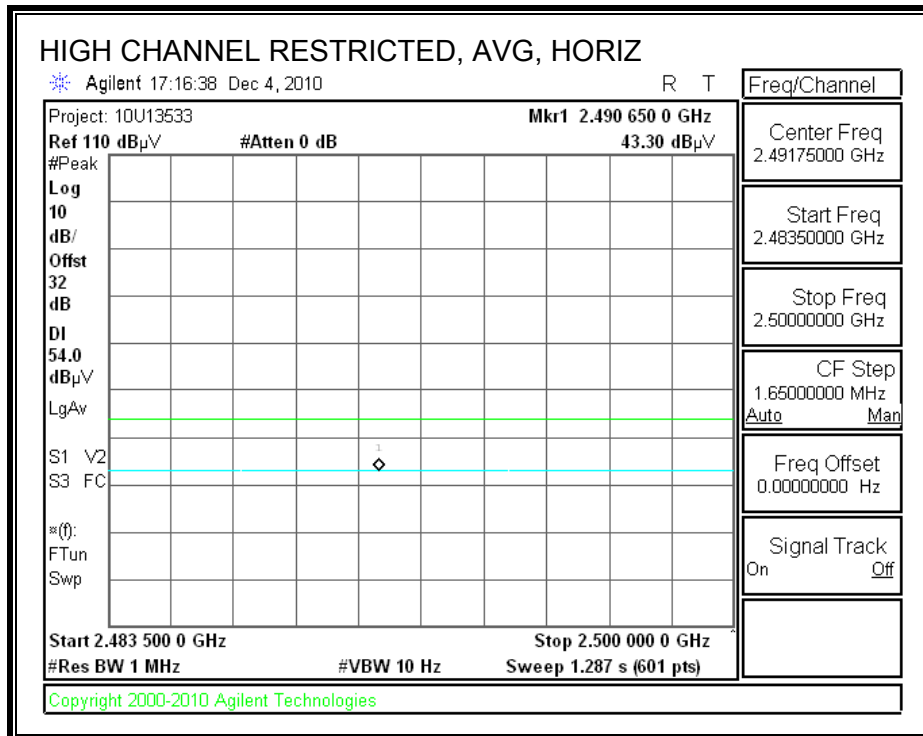
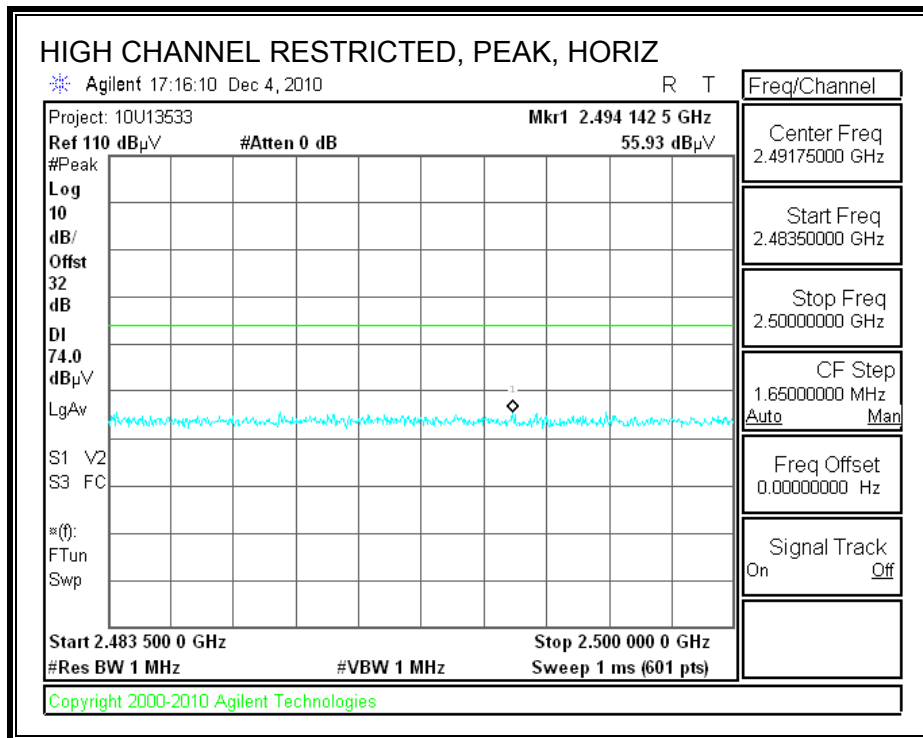
### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



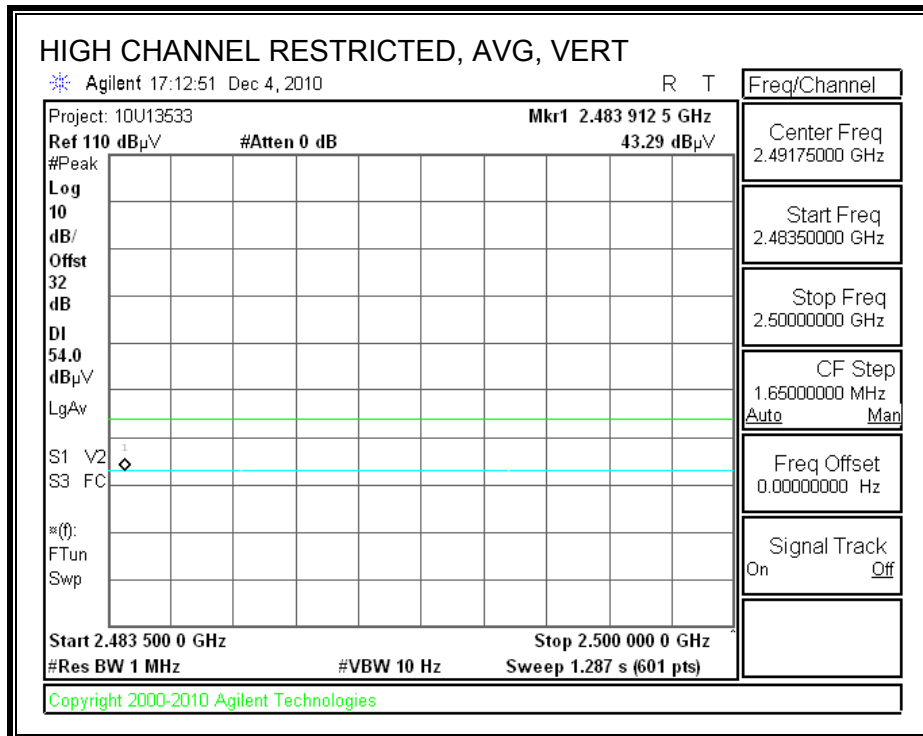
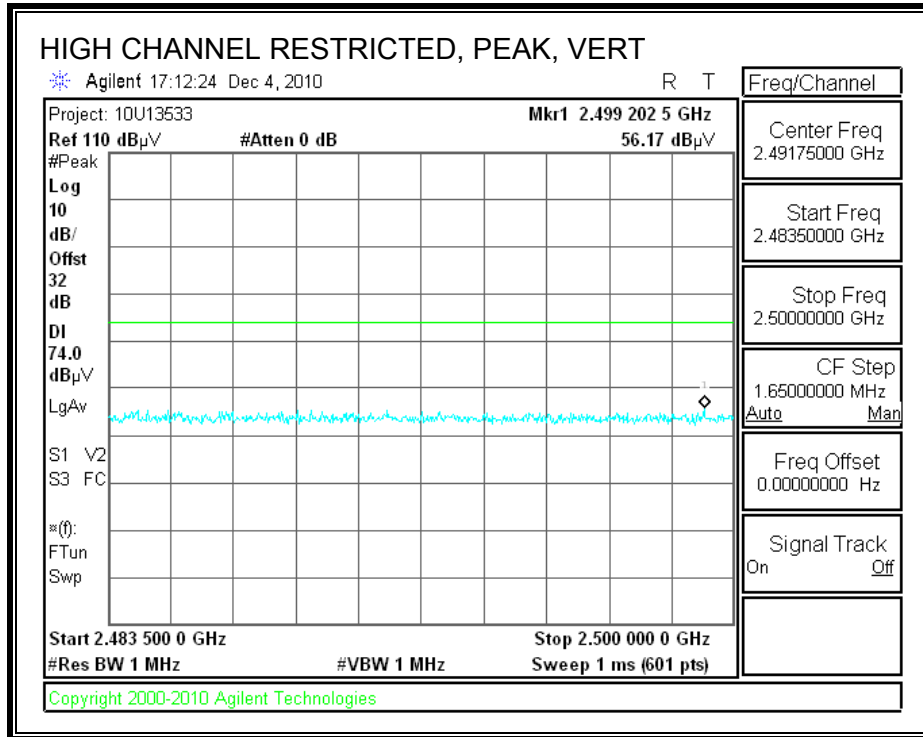
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



**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: William Zhuang  
 Date: 12/04/10  
 Project #: 10U13533  
 Company: Anaren  
 Test Target: CFR 47  
 Mode Oper: Power Setting: 0

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

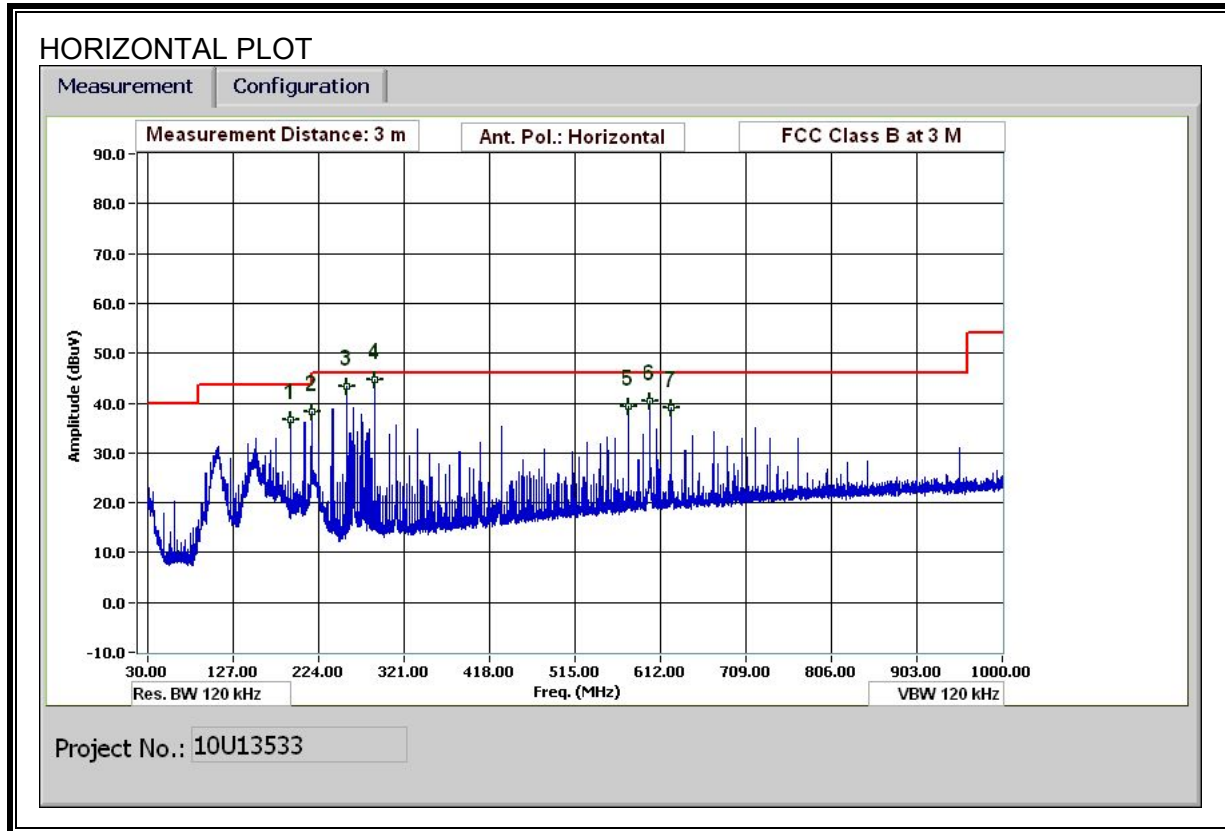
| f GHz                    | Dist (m) | Read dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fitr dB | Corr. dBuV/m | Limit dBuV/m | Margin dB | Ant. Pol V/H | Det. P/A/QP | Ant.High cm | Table Angle Degree | Notes |
|--------------------------|----------|-----------|---------|-------|--------|-----------|---------|--------------|--------------|-----------|--------------|-------------|-------------|--------------------|-------|
| <b>Low Ch. 2406 MHz</b>  |          |           |         |       |        |           |         |              |              |           |              |             |             |                    |       |
| 4.812                    | 3.0      | 46.1      | 33.0    | 5.8   | -36.5  | 0.0       | 0.0     | 48.5         | 74.0         | -25.5     | V            | P           | 153.8       | 188.3              |       |
| 4.812                    | 3.0      | 43.3      | 33.0    | 5.8   | -36.5  | 0.0       | 0.0     | 45.6         | 54.0         | -8.4      | V            | A           | 153.8       | 188.3              |       |
| 12.030                   | 3.0      | 35.4      | 39.0    | 9.8   | -35.4  | 0.0       | 0.0     | 48.7         | 74.0         | -25.3     | V            | P           | 100.0       | 234.8              |       |
| 12.030                   | 3.0      | 23.5      | 39.0    | 9.8   | -35.4  | 0.0       | 0.0     | 36.8         | 54.0         | -17.2     | V            | A           | 100.0       | 234.8              |       |
| 4.812                    | 3.0      | 41.9      | 33.0    | 5.8   | -36.5  | 0.0       | 0.0     | 44.3         | 74.0         | -29.7     | H            | P           | 197.6       | 278.4              |       |
| 4.812                    | 3.0      | 36.4      | 33.0    | 5.8   | -36.5  | 0.0       | 0.0     | 38.8         | 54.0         | -15.2     | H            | A           | 197.6       | 278.4              |       |
| 12.030                   | 3.0      | 35.5      | 39.0    | 9.8   | -35.4  | 0.0       | 0.0     | 48.8         | 74.0         | -25.2     | H            | P           | 100.0       | 102.4              |       |
| 12.030                   | 3.0      | 23.6      | 39.0    | 9.8   | -35.4  | 0.0       | 0.0     | 36.9         | 54.0         | -17.1     | H            | A           | 100.0       | 102.4              |       |
| <b>Mid Ch. 2438 MHz</b>  |          |           |         |       |        |           |         |              |              |           |              |             |             |                    |       |
| 4.876                    | 3.0      | 45.5      | 33.1    | 5.8   | -36.5  | 0.0       | 0.0     | 47.9         | 74.0         | -26.1     | V            | P           | 100.4       | 54.0               |       |
| 4.876                    | 3.0      | 41.9      | 33.1    | 5.8   | -36.5  | 0.0       | 0.0     | 44.4         | 54.0         | -9.6      | V            | A           | 100.4       | 54.0               |       |
| 7.314                    | 3.0      | 45.9      | 35.3    | 7.3   | -36.2  | 0.0       | 0.0     | 52.3         | 74.0         | -21.7     | V            | P           | 200.0       | 115.9              |       |
| 7.314                    | 3.0      | 34.3      | 35.3    | 7.3   | -36.2  | 0.0       | 0.0     | 40.7         | 54.0         | -13.3     | V            | A           | 200.0       | 115.9              |       |
| 12.190                   | 3.0      | 37.6      | 39.0    | 9.8   | -35.4  | 0.0       | 0.0     | 51.0         | 74.0         | -23.0     | V            | P           | 166.2       | 288.8              |       |
| 12.190                   | 3.0      | 25.4      | 39.0    | 9.8   | -35.4  | 0.0       | 0.0     | 38.8         | 54.0         | -15.2     | V            | A           | 166.2       | 288.8              |       |
| 4.876                    | 3.0      | 42.6      | 33.1    | 5.8   | -36.5  | 0.0       | 0.0     | 45.1         | 74.0         | -29.0     | H            | P           | 102.9       | 182.8              |       |
| 4.876                    | 3.0      | 38.0      | 33.1    | 5.8   | -36.5  | 0.0       | 0.0     | 40.5         | 54.0         | -13.5     | H            | A           | 102.9       | 182.8              |       |
| 7.314                    | 3.0      | 49.8      | 35.3    | 7.3   | -36.2  | 0.0       | 0.0     | 56.1         | 74.0         | -17.9     | H            | P           | 152.4       | 314.3              |       |
| 7.314                    | 3.0      | 38.2      | 35.3    | 7.3   | -36.2  | 0.0       | 0.0     | 44.5         | 54.0         | -9.5      | H            | A           | 152.4       | 314.3              |       |
| 12.190                   | 3.0      | 36.1      | 39.0    | 9.8   | -35.4  | 0.0       | 0.0     | 49.5         | 74.0         | -24.5     | H            | P           | 129.1       | 8.8                |       |
| 12.190                   | 3.0      | 24.0      | 39.0    | 9.8   | -35.4  | 0.0       | 0.0     | 37.4         | 54.0         | -16.6     | H            | A           | 129.1       | 8.8                |       |
| <b>High Ch. 2474 MHz</b> |          |           |         |       |        |           |         |              |              |           |              |             |             |                    |       |
| 4.948                    | 3.0      | 45.1      | 33.2    | 5.9   | -36.5  | 0.0       | 0.0     | 47.7         | 74.0         | -26.3     | V            | P           | 104.8       | 171.2              |       |
| 4.948                    | 3.0      | 41.2      | 33.2    | 5.9   | -36.5  | 0.0       | 0.0     | 43.8         | 54.0         | -10.2     | V            | A           | 104.8       | 171.2              |       |
| 7.422                    | 3.0      | 45.7      | 35.5    | 7.3   | -36.2  | 0.0       | 0.0     | 52.3         | 74.0         | -21.7     | V            | P           | 129.8       | 298.2              |       |
| 7.422                    | 3.0      | 34.3      | 35.5    | 7.3   | -36.2  | 0.0       | 0.0     | 40.9         | 54.0         | -13.1     | V            | A           | 129.8       | 298.2              |       |
| 12.370                   | 3.0      | 38.4      | 39.0    | 9.9   | -35.4  | 0.0       | 0.0     | 51.9         | 74.0         | -22.1     | V            | P           | 100.5       | 284.0              |       |
| 12.370                   | 3.0      | 25.6      | 39.0    | 9.9   | -35.4  | 0.0       | 0.0     | 39.1         | 54.0         | -14.9     | V            | A           | 100.5       | 284.0              |       |
| 4.948                    | 3.0      | 42.2      | 33.2    | 5.9   | -36.5  | 0.0       | 0.0     | 44.8         | 74.0         | -29.2     | H            | P           | 100.4       | 186.8              |       |
| 4.948                    | 3.0      | 37.2      | 33.2    | 5.9   | -36.5  | 0.0       | 0.0     | 39.8         | 54.0         | -14.2     | H            | A           | 100.4       | 186.8              |       |
| 7.422                    | 3.0      | 50.7      | 35.5    | 7.3   | -36.2  | 0.0       | 0.0     | 57.3         | 74.0         | -16.7     | H            | P           | 172.1       | 316.2              |       |
| 7.422                    | 3.0      | 39.2      | 35.5    | 7.3   | -36.2  | 0.0       | 0.0     | 45.8         | 54.0         | -8.2      | H            | A           | 172.1       | 316.2              |       |
| 12.370                   | 3.0      | 35.7      | 39.0    | 9.9   | -35.4  | 0.0       | 0.0     | 49.2         | 74.0         | -24.8     | H            | P           | 170.8       | 277.3              |       |
| 12.370                   | 3.0      | 23.9      | 39.0    | 9.9   | -35.4  | 0.0       | 0.0     | 37.4         | 54.0         | -16.6     | H            | A           | 170.8       | 277.3              |       |

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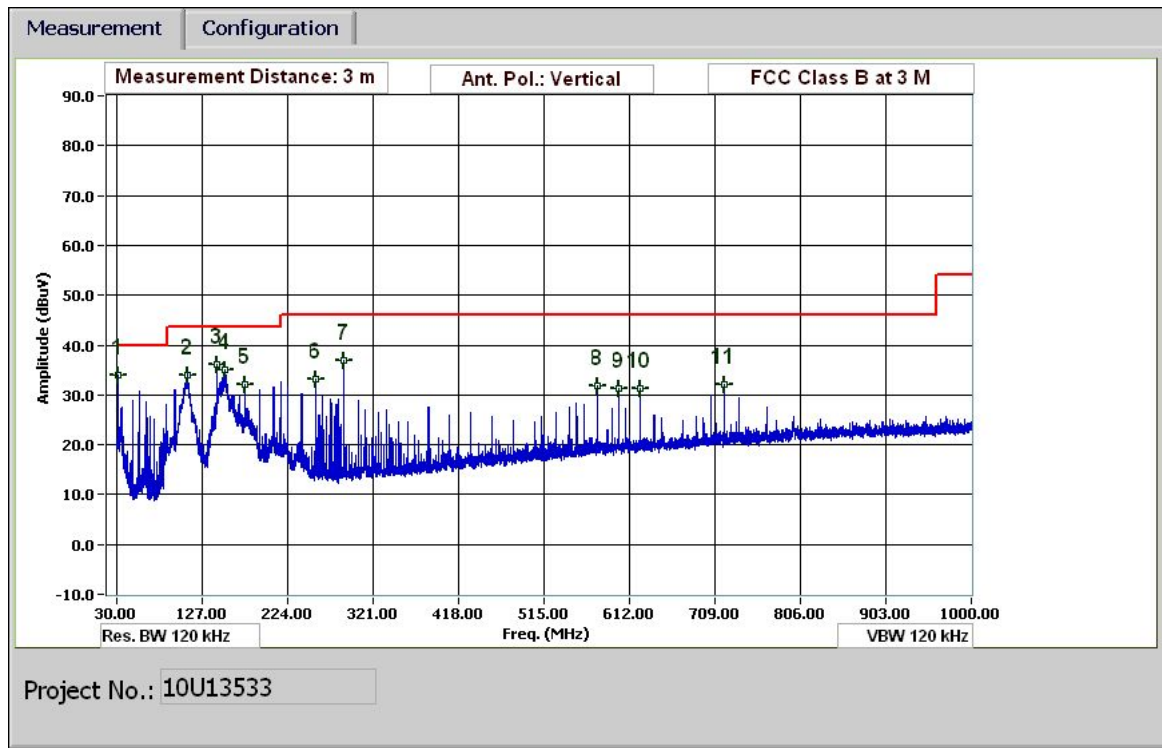
Note: No other emissions were detected above the system noise floor.

### 8.3. WORST-CASE BELOW 1 GHz

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



### VERTICAL PLOT





**VERTICAL AND HORIZONTAL DATA**

| VERTICAL AND HORIZONTAL DATA                          |                       |                |      |        |                              |        |     |        |                  |        |           |        |       |
|---|-----------------------|----------------|------|--------|------------------------------|--------|-----|--------|------------------|--------|-----------|--------|-------|
| 30-1000MHz Frequency Measurement                      |                       |                |      |        |                              |        |     |        |                  |        |           |        |       |
| Compliance Certification Services, Fremont 5m Chamber |                       |                |      |        |                              |        |     |        |                  |        |           |        |       |
| Test Engr:  |                       | William Zhuang |      |        |                              |        |     |        |                  |        |           |        |       |
| Date:   |                       | 12/04/10       |      |        |                              |        |     |        |                  |        |           |        |       |
| Project #:  |                       | 10U13533       |      |        |                              |        |     |        |                  |        |           |        |       |
| Company:  |                       | Anaren         |      |        |                              |        |     |        |                  |        |           |        |       |
| Test Target:  |                       | FCC CLASS B    |      |        |                              |        |     |        |                  |        |           |        |       |
| Mode Oper:  |                       | TX MODE        |      |        |                              |        |     |        |                  |        |           |        |       |
| 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   | Dist                  | Read           | AF   | CL     | Amp                          | D Corr | Pad | Corr.  | Limit            | Margin | Ant. Pol. | Det.   | Notes |
| MHz   | (m)                   | dBuV           | dB/m | dB     | dB                           | dB     | dB  | dBuV/m | dBuV/m           | dB     | V/H       | P/A/QP |       |
| 32.04   | 3.0                   | 42.5           | 19.2 | 0.5    | 28.4                         | 0.0    | 0.0 | 33.9   | 40.0             | -6.1   | V         | P      |       |
| 110.043   | 3.0                   | 49.6           | 11.8 | 1.0    | 28.3                         | 0.0    | 0.0 | 34.0   | 43.5             | -9.5   | V         | P      |       |
| 144.005   | 3.0                   | 50.3           | 13.0 | 1.1    | 28.3                         | 0.0    | 0.0 | 36.2   | 43.5             | -7.3   | V         | P      |       |
| 152.285   | 3.0                   | 49.8           | 12.4 | 1.1    | 28.3                         | 0.0    | 0.0 | 35.0   | 43.5             | -8.5   | V         | P      |       |
| 176.046   | 3.0                   | 48.7           | 10.6 | 1.2    | 28.2                         | 0.0    | 0.0 | 32.2   | 43.5             | -11.3  | V         | P      |       |
| 255.969   | 3.0                   | 48.1           | 12.0 | 1.4    | 28.2                         | 0.0    | 0.0 | 33.3   | 46.0             | -12.7  | V         | P      |       |
| 288.011   | 3.0                   | 50.6           | 13.0 | 1.5    | 28.1                         | 0.0    | 0.0 | 37.0   | 46.0             | -9.0   | V         | P      |       |
| 576.023   | 3.0                   | 39.3           | 18.0 | 2.2    | 27.6                         | 0.0    | 0.0 | 31.9   | 46.0             | -14.1  | V         | P      |       |
| 600.024   | 3.0                   | 38.1           | 18.4 | 2.2    | 27.5                         | 0.0    | 0.0 | 31.2   | 46.0             | -14.8  | V         | P      |       |
| 624.024   | 3.0                   | 37.8           | 18.7 | 2.3    | 27.4                         | 0.0    | 0.0 | 31.4   | 46.0             | -14.6  | V         | P      |       |
| 720.028   | 3.0                   | 36.9           | 19.9 | 2.5    | 27.2                         | 0.0    | 0.0 | 32.0   | 46.0             | -14.0  | V         | P      |       |
| 192.007   | 3.0                   | 52.2           | 11.5 | 1.2    | 28.2                         | 0.0    | 0.0 | 36.7   | 43.5             | -6.8   | H         | P      |       |
| 216.008   | 3.0                   | 53.4           | 11.9 | 1.3    | 28.2                         | 0.0    | 0.0 | 38.4   | 46.0             | -7.6   | H         | P      |       |
| 255.969   | 3.0                   | 58.2           | 12.0 | 1.4    | 28.2                         | 0.0    | 0.0 | 43.3   | 46.0             | -2.7   | H         | P      |       |
| 288.011   | 3.0                   | 58.4           | 13.0 | 1.5    | 28.1                         | 0.0    | 0.0 | 44.7   | 46.0             | -1.3   | H         | P      |       |
| 576.023   | 3.0                   | 46.8           | 18.0 | 2.2    | 27.6                         | 0.0    | 0.0 | 39.4   | 46.0             | -6.6   | H         | P      |       |
| 600.024   | 3.0                   | 47.3           | 18.4 | 2.2    | 27.5                         | 0.0    | 0.0 | 40.5   | 46.0             | -5.5   | H         | P      |       |
| 624.024   | 3.0                   | 45.4           | 18.7 | 2.3    | 27.4                         | 0.0    | 0.0 | 38.9   | 46.0             | -7.1   | H         | P      |       |

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

### 8.4. RX SPURIOUS EMISSIONS ABOVE 1 GHz

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

Company: Anaren  
 Project #: 10u13533  
 Date: 12/4/2010  
 Test Engineer: William Zhuang  
 Configuration: EUT AND SUPPORT EQUIPMENT  
 Mode: RX MODE

**Test Equipment:**

|                    |                       |                        |              |            |
|--------------------|-----------------------|------------------------|--------------|------------|
| Horn 1-18GHz       | Pre-amplifier 1-26GHz | Pre-amplifier 26-40GHz | Horn > 18GHz | Limit      |
| T73; S/N: 6717 @3m | T144 Miteq 3008A00931 |                        |              | RX RSS 210 |

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 |     |               | Average Measurements<br>RBW=1MHz ; VBW=10Hz |

| f<br>GHz | Dist<br>(m) | Read Pk<br>dBuV | Read Avg<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | Fldr<br>dB | Peak<br>dBuV/m | Avg<br>dBuV/m | Pk Lim<br>dBuV/m | Avg Lim<br>dBuV/m | Pk Mar<br>dB | Avg Mar<br>dB | Notes<br>(V/H) |
|----------|-------------|-----------------|------------------|------------|----------|-----------|--------------|------------|----------------|---------------|------------------|-------------------|--------------|---------------|----------------|
| 1.092    | 3.0         | 53.4            | 35.4             | 24.2       | 2.5      | -39.4     | 0.0          | 0.0        | 40.7           | 22.6          | 74               | 54                | -33.3        | -31.4         | H              |
| 1.400    | 3.0         | 51.2            | 35.0             | 25.2       | 2.8      | -38.9     | 0.0          | 0.0        | 40.3           | 24.1          | 74               | 54                | -33.7        | -29.9         | H              |
| 1.600    | 3.0         | 48.0            | 33.5             | 25.9       | 3.0      | -38.6     | 0.0          | 0.0        | 38.2           | 23.7          | 74               | 54                | -35.8        | -30.3         | H              |
| 1.092    | 3.0         | 61.7            | 37.9             | 24.2       | 2.5      | -39.4     | 0.0          | 0.0        | 49.0           | 25.2          | 74               | 54                | -25.0        | -28.8         | V              |
| 1.400    | 3.0         | 57.8            | 38.3             | 25.2       | 2.8      | -38.9     | 0.0          | 0.0        | 46.9           | 27.4          | 74               | 54                | -27.1        | -26.6         | V              |
| 1.600    | 3.0         | 58.3            | 39.2             | 25.9       | 3.0      | -38.6     | 0.0          | 0.0        | 48.6           | 29.5          | 74               | 54                | -25.4        | -24.5         | V              |

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

## 9. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

\*Decreases with the logarithm of the frequency.

### TEST PROCEDURE

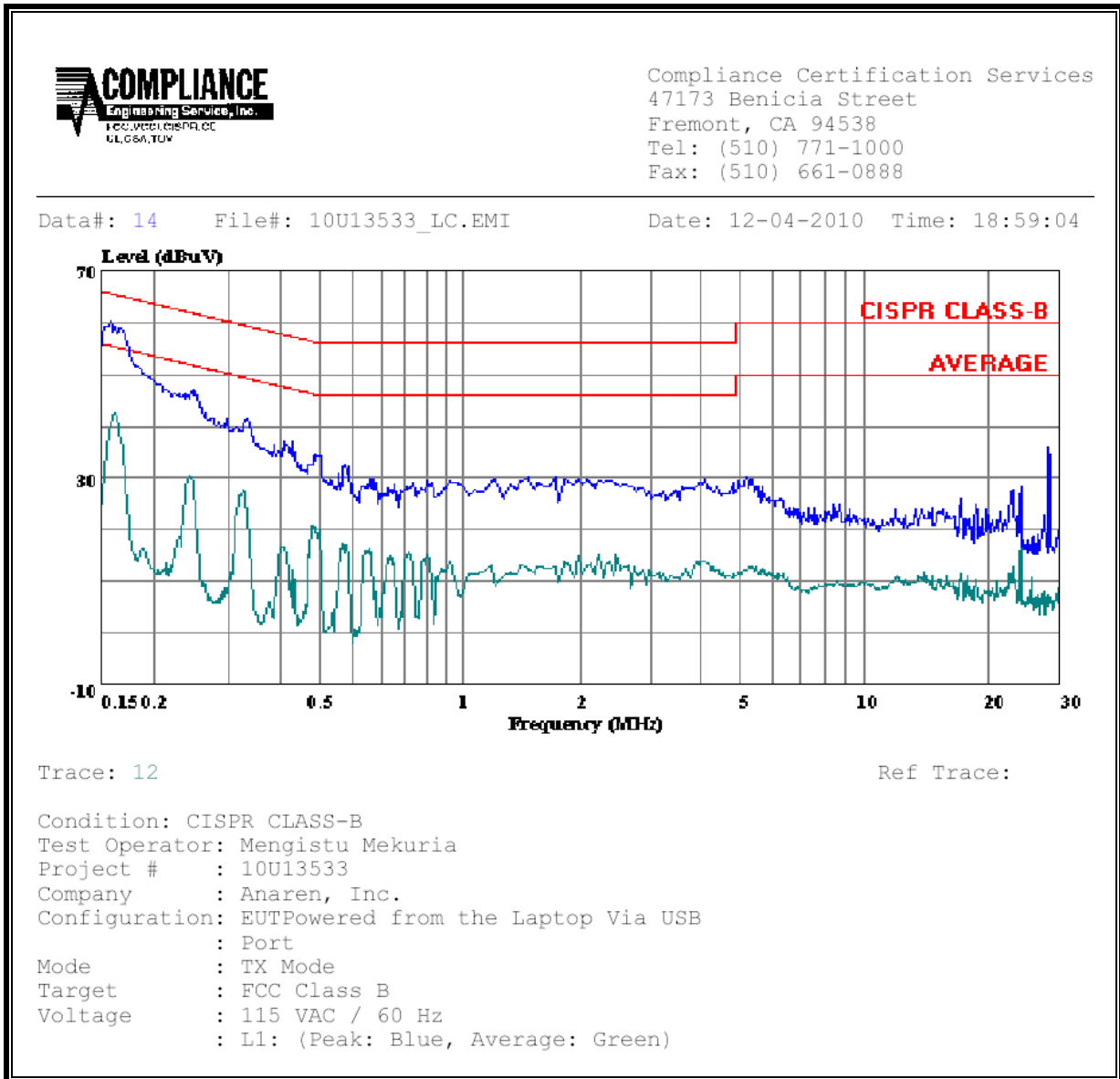
ANSI C63.4

### RESULTS

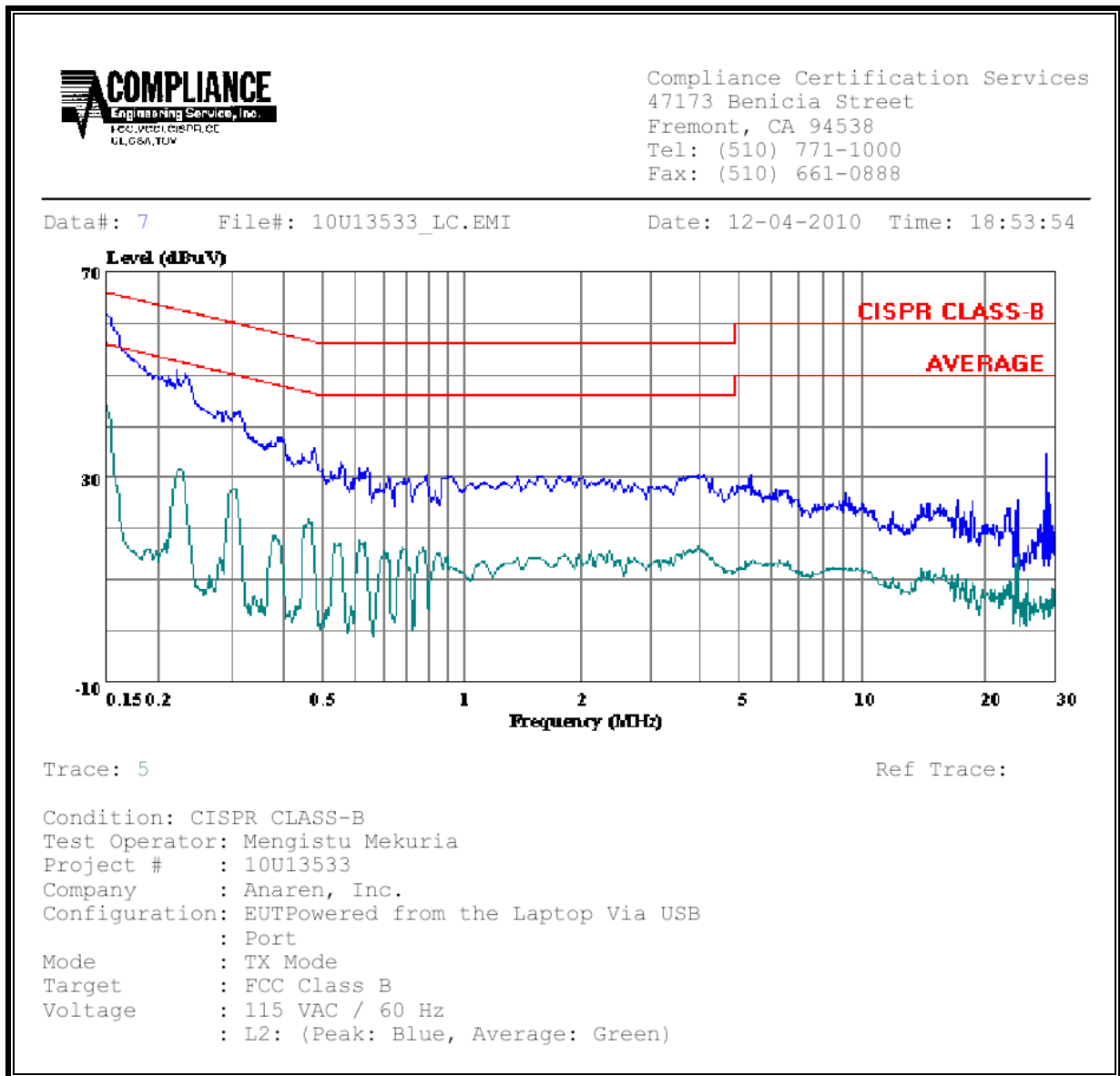
**6 WORST EMISSIONS (WORST CASE)**

| CONDUCTED EMISSIONS DATA (115VAC 60Hz) |           |           |           |       |       |       |         |         |         |
|--|-----------|-----------|-----------|-------|-------|-------|---------|---------|---------|
| Freq.                                  | Reading   |           |           | Class | Limit | EN B  | Margin  |         | Remark  |
| (MHz)                                  | PK (dBuV) | QP (dBuV) | AV (dBuV) | (dB)  | QP    | AV    | QP (dB) | AV (dB) | L1 / L2 |
| 0.15                                   | 61.67     | --        | 44.09     | 0.00  | 66.00 | 56.00 | -4.33   | -11.91  | L1      |
| 0.23                                   | 50.15     | --        | 31.59     | 0.00  | 62.38 | 52.38 | -12.23  | -20.79  | L1      |
| 0.31                                   | 43.08     | --        | 27.32     | 0.00  | 59.89 | 49.89 | -16.81  | -22.57  | L1      |
| 0.16                                   | 60.31     | --        | 42.52     | 0.00  | 65.62 | 55.62 | -5.31   | -13.10  | L2      |
| 0.25                                   | 47.30     | --        | 30.49     | 0.00  | 61.79 | 51.79 | -14.49  | -21.30  | L2      |
| 0.33                                   | 41.57     | --        | 27.71     | 0.00  | 59.35 | 49.35 | -17.78  | -21.64  | L2      |
| 6 Worst Data                           |           |           |           |       |       |       |         |         |         |

**LINE 1 RESULTS**



**LINE 2 RESULTS**



## 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.

**IC RULES**

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

**Table 5  
 Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)**

| 1<br>Frequency<br>(MHz) | 2<br>Electric Field<br>Strength; rms<br>(V/m) | 3<br>Magnetic Field<br>Strength; rms<br>(A/m)   | 4<br>Power<br>Density<br>(W/m <sup>2</sup> ) | 5<br>Averaging<br>Time<br>(min)   |
|-------------------------|---|---|--|-----------------------------------|
| 0.003–1                 | 280   | 2.19  |  | 6                                 |
| 1–10                    | 280/ <i>f</i>                                 | 2.19/ <i>f</i>                                  |  | 6                                 |
| 10–30                   | 28  | 2.19/ <i>f</i>                                  |  | 6                                 |
| 30–300                  | 28  | 0.073   | 2*   | 6                                 |
| 300–1 500               | 1.585 <i>f</i> <sup>0.5</sup>                 | 0.0042 <i>f</i> <sup>0.5</sup>                  | <i>f</i> /150                                | 6                                 |
| 1 500–15 000            | 61.4  | 0.163   | 10   | 6                                 |
| 15 000–150 000          | 61.4  | 0.163   | 10   | 616 000 / <i>f</i> <sup>1.2</sup> |
| 150 000–300 000         | 0.158 <i>f</i> <sup>0.5</sup>                 | 4.21 x 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup> | 6.67 x 10 <sup>-5</sup> <i>f</i>             | 616 000 / <i>f</i> <sup>1.2</sup> |

\* Power density limit is applicable at frequencies greater than 100 MHz.

- Notes:**
1. Frequency, *f*, is in MHz.
  2. A power density of 10 W/m<sup>2</sup> is equivalent to 1 mW/cm<sup>2</sup>.
  3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).



## **EQUATIONS**

Power density is given by:

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

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.

Distance is given by:

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

where

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

For multiple colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the Power \* Gain product (in linear units) of each transmitter.

$$\text{Total EIRP} = (P1 * G1) + (P2 * G2) + \dots + (Pn * Gn)$$

where

Px = Power of transmitter x  
Gx = Numeric gain of antenna x

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>

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m<sup>2</sup>

**RESULTS**

| Band    | Mode | Separation<br>Distance<br>(m) | Output<br>Power<br>(dBm) | Antenna<br>Gain<br>(dBi) | IC Power<br>Density<br>(W/m <sup>2</sup> ) | FCC Power<br>Density<br>(mW/cm <sup>2</sup> ) |
|---------|------|-------------------------------|--------------------------|--------------------------|--|---|
| 2.4 GHz | QPSK | 0.20                          | 13.91                    | 2.00                     | 0.08                                       | 0.008   |