



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

**CERTIFICATION TEST REPORT**

**FOR**

**EMERGENCY LIGHTING CONTROLLER**

**MODEL NUMBER: SNSELM100**

**FCC ID: PZ3-SNSE  
IC: 4256A-SNSE**

**REPORT NUMBER: 10U13541-1**

**ISSUE DATE: DECEMBER 6, 2010**

*Prepared for*  
**Primex, Inc.**  
**N3211 Highway H**  
**Lake Geneva, WI 53147**

*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	F. Ibrahim



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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Primex, Inc.  
N3211 Highway H  
Lake Geneva, WI 53147

**EUT DESCRIPTION:** EMERGENCY LIGHTNING CONTROLLER

**MODEL:** SNSELM100

**SERIAL NUMBER:** CCS01001& 01003

**DATE TESTED:** DECEMBER 01-02, 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 (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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

Approved & Released For UL CCS By:



FRANK IBRAHIM  
EMC SUPERVISOR  
UL CCS

Tested By:



THANH NGUYEN  
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 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.

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

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

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

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

### 4.3. MEASUREMENT UNCERTAINTY

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

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

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is an 802.11b/g transceiver module used in Emergency Lighting Controller.

The radio module is manufactured by Primex Wireless, Inc.

### 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	15.63	36.56
2412 - 2462	802.11g	21.24	133.05

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a permanently attached antenna, with a maximum gain of -1.2 dBi.

### 5.4. SOFTWARE AND FIRMWARE

The Micro Controller firmware installed in the EUT during testing was SNS\_E\_LIGHT-1\_0.a43.

The Radio firmware used during testing was SNS\_RADIO-2.1.74.rom.

The test utility software used during testing was ART Rev 5.2 Build #58.

### 5.5. WORST-CASE CONFIGURATION AND MODE

EUT was investigated for three orthogonal orientations and it was determined that orientation X is worst-case, see set up photos for details.

The worst-case channel is determined as the channel with the highest output power; therefore, radiated emission below 1000 MHz was performed with the EUT set to the channel with highest output power.

The worst-case data rate for each mode is determined to be as follows, based on input from the manufacturer of the radio.

All final tests in the 802.11b mode were made at 1 Mb/s.

All final tests in the 802.11g mode were made at 6 Mb/s.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	DELL	PP01X	8619137497	DoC
AC/DC Adapter	DELL	ADP-90FB Rev B	TH-06G356-17971	DoC

### I/O CABLES

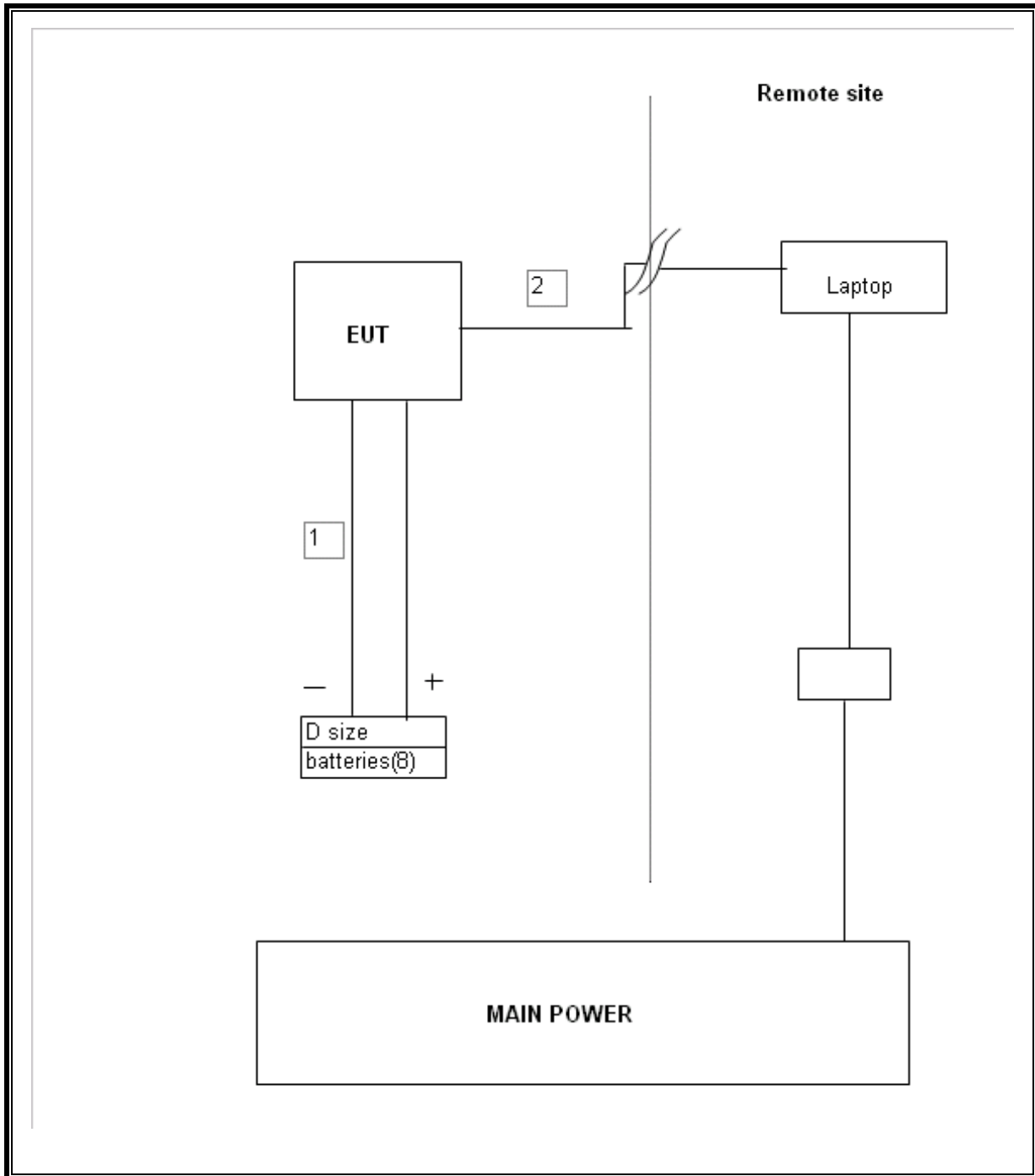
I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	DC	1	DC Plug	26 AWG	.5m	Batteries power
2	WLAN	1	RJ45	Un-shielded	10m	to remote Laptop

### TEST SETUP

The EUT is a stand alone unit connected to a host laptop computer at remote site. 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 Date	Cal Due
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	1/14/2009	12/18/2010
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	3/31/2009	12/19/2010
Spectrum Analyzer	Agilent / HP	E4446A	C01069	1/5/2010	4/5/2011
Power Meter	HP	4416A	C00963	12/4/2009	12/4/2011
Power sensor	HP	8482A	2349A08568	4/14/2009	4/14/2011
Antenna, Horn, 18 GHz	EMCO	3115	C00945	4/22/2009	12/18/2010
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	8/5/2009	12/17/2010
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/29/2010	10/29/2011
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	10/29/2010	10/29/2011
EMI Receiver	R & S	ESHS 20	N02396	6/8/2009	5/6/2011

## 7. ANTENNA PORT TEST RESULTS

### 7.1. 802.11b MODE IN THE 2.4 GHz BAND

#### 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.

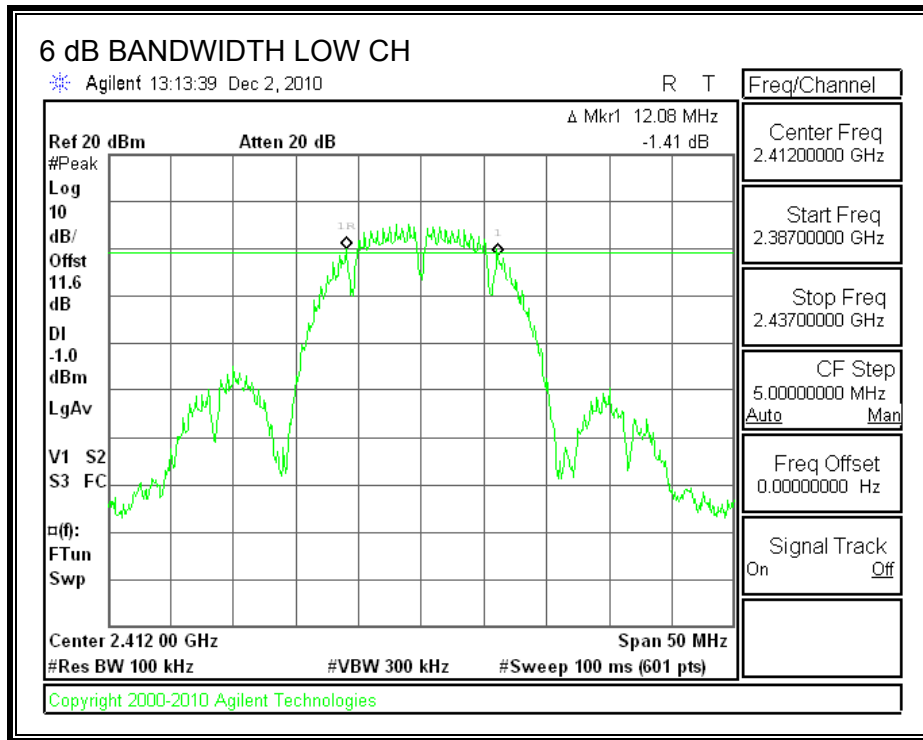
##### TEST PROCEDURE

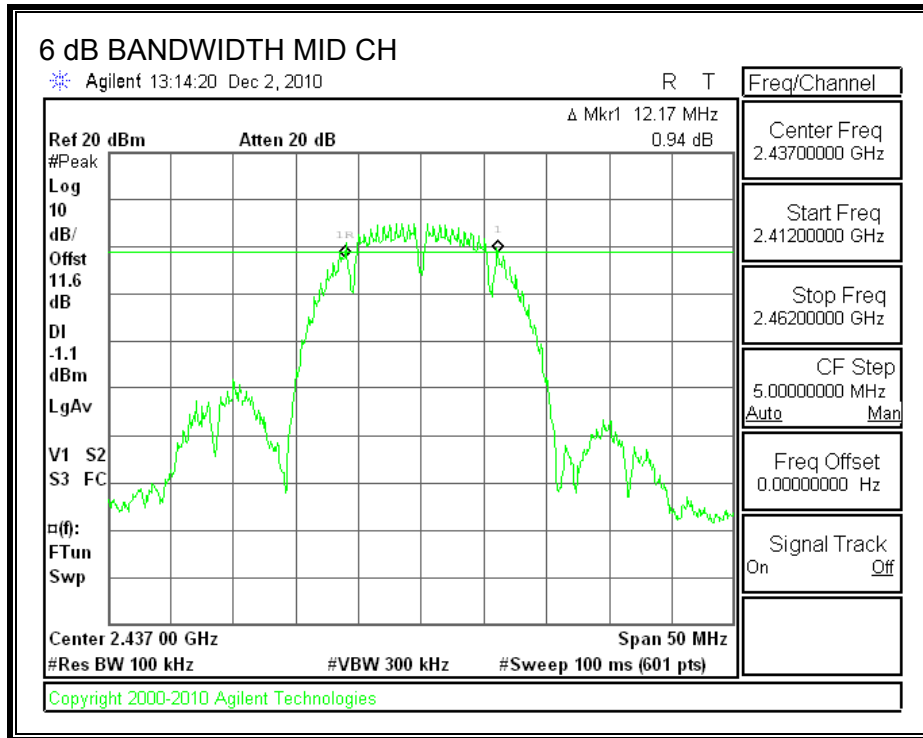
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

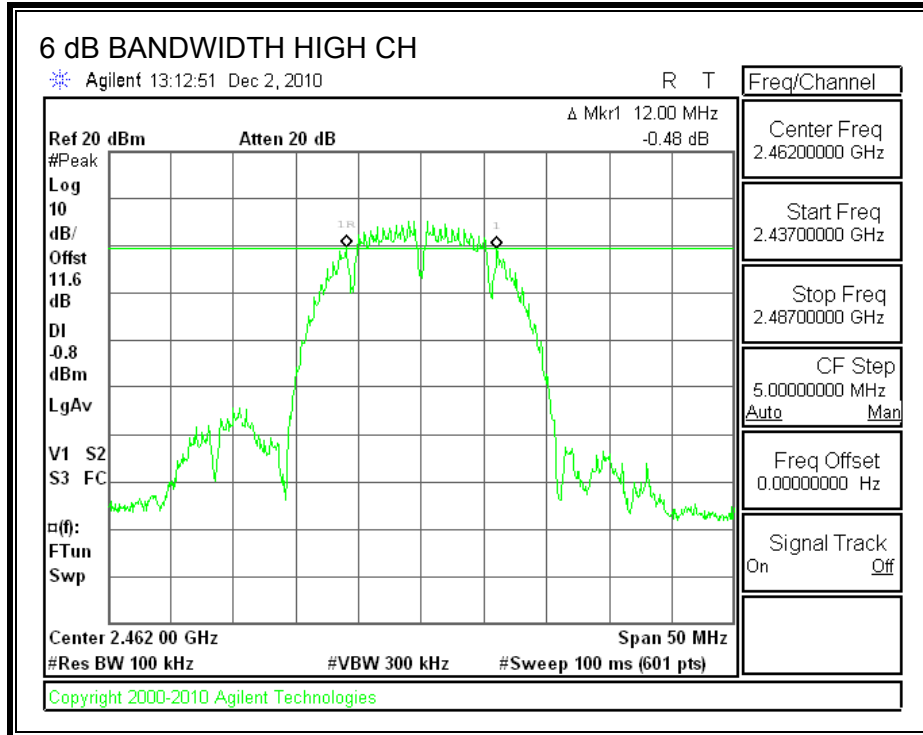
##### RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	12.08	0.5
Middle	2437	12.17	0.5
High	2462	12	0.5

**6 dB BANDWIDTH**







## 7.1.2. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

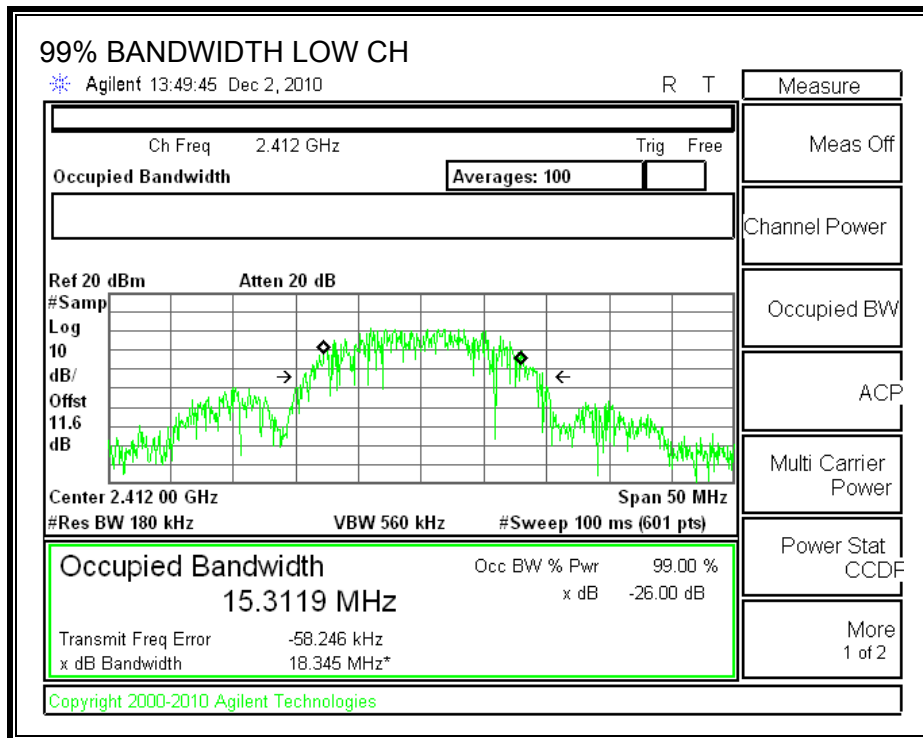
### TEST PROCEDURE

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.

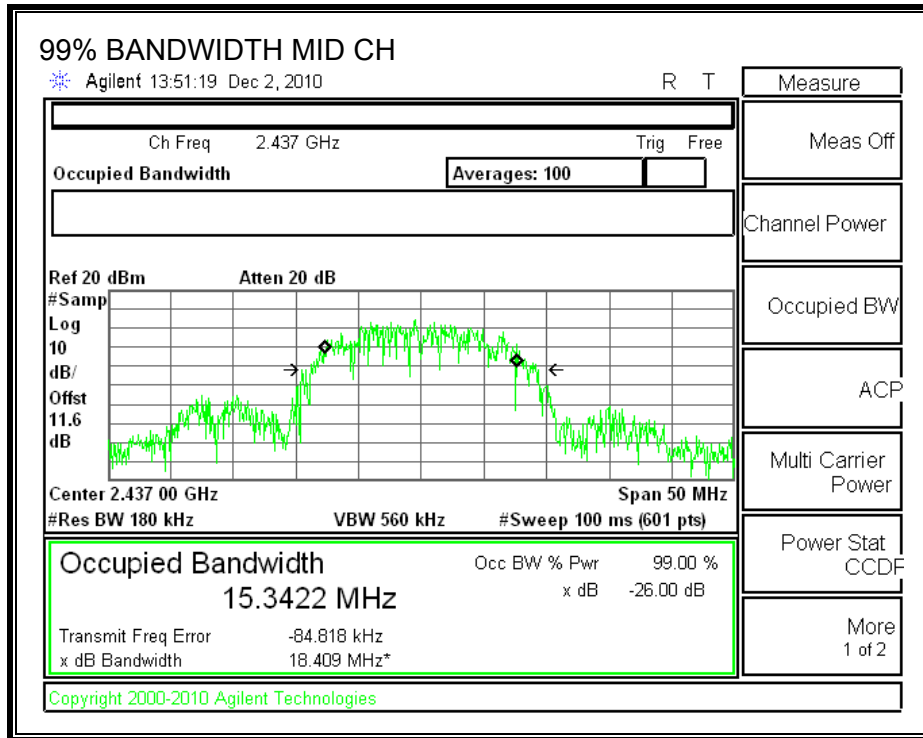
### RESULTS

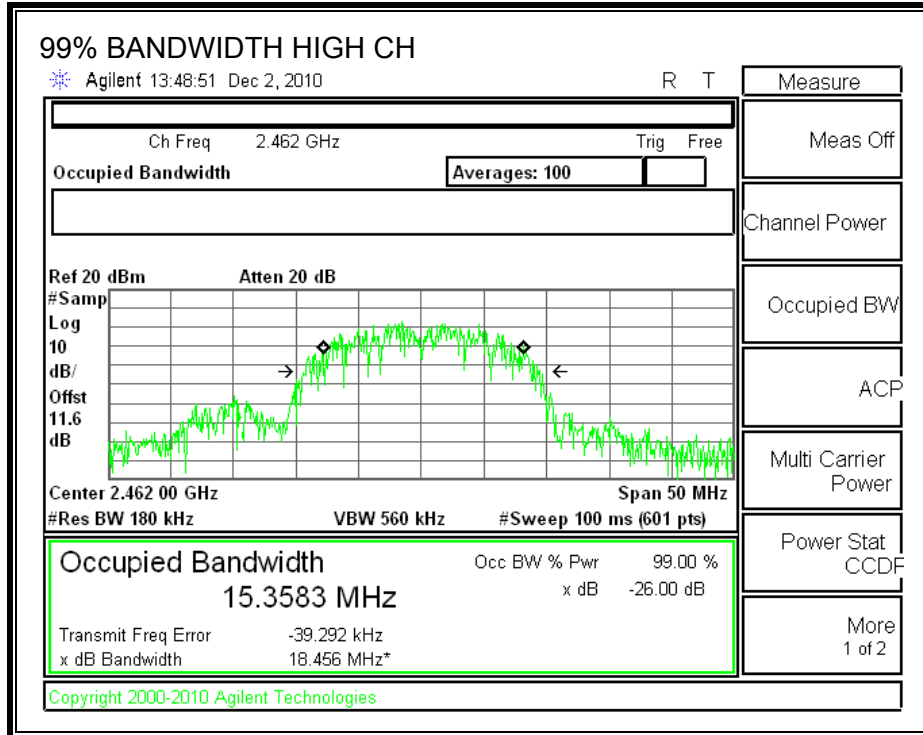
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	15.3119
Middle	2437	15.3422
High	2462	15.3583

**99% BANDWIDTH**









### 7.1.3. PEAK 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 11.6 dB (including 10 dB pad and 1.6 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	15.63
Middle	2437	15.35
High	2462	15.57

### 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 11.6 dB (including 10 dB pad and 1.6 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	14.80
Middle	2437	14.86
High	2462	14.99

### 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.

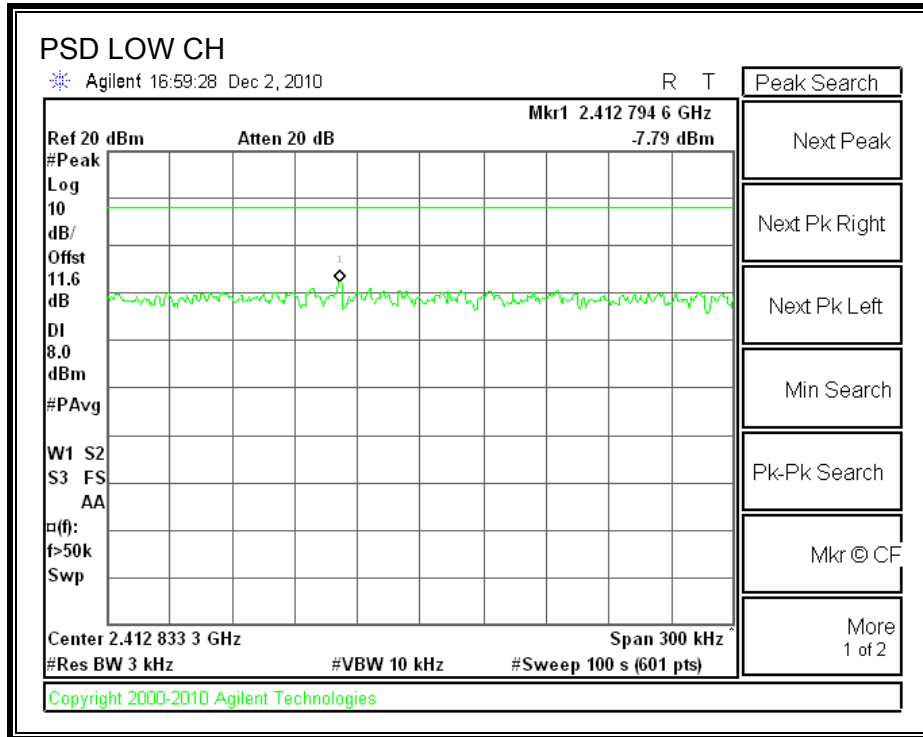
#### TEST PROCEDURE

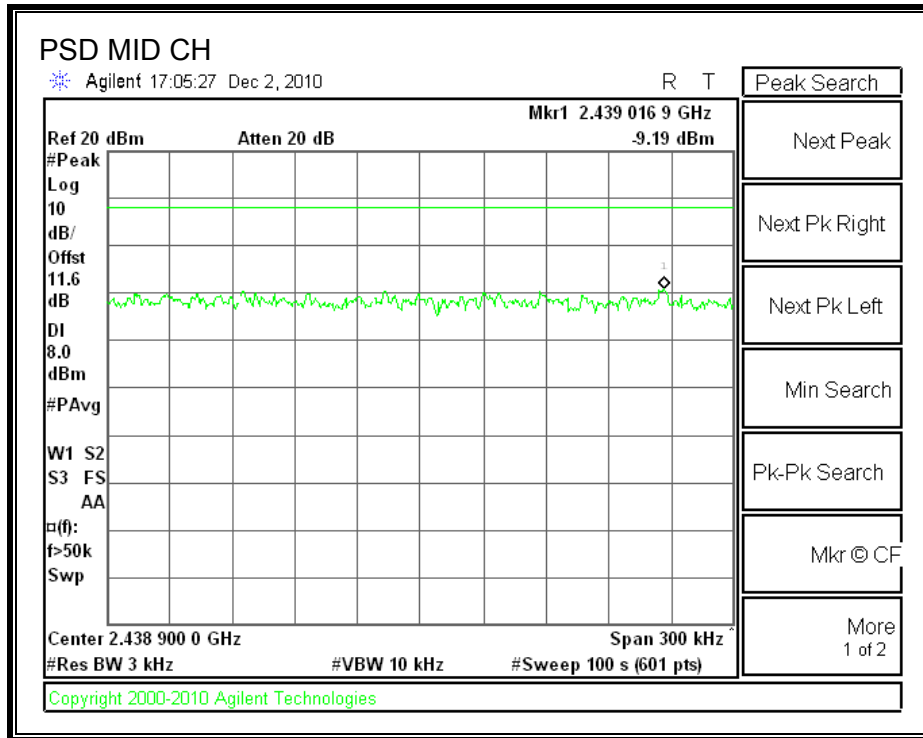
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

#### RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-7.79	8	-15.79
Middle	2437	-9.19	8	-17.19
High	2462	-9.01	8	-17.01

**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.

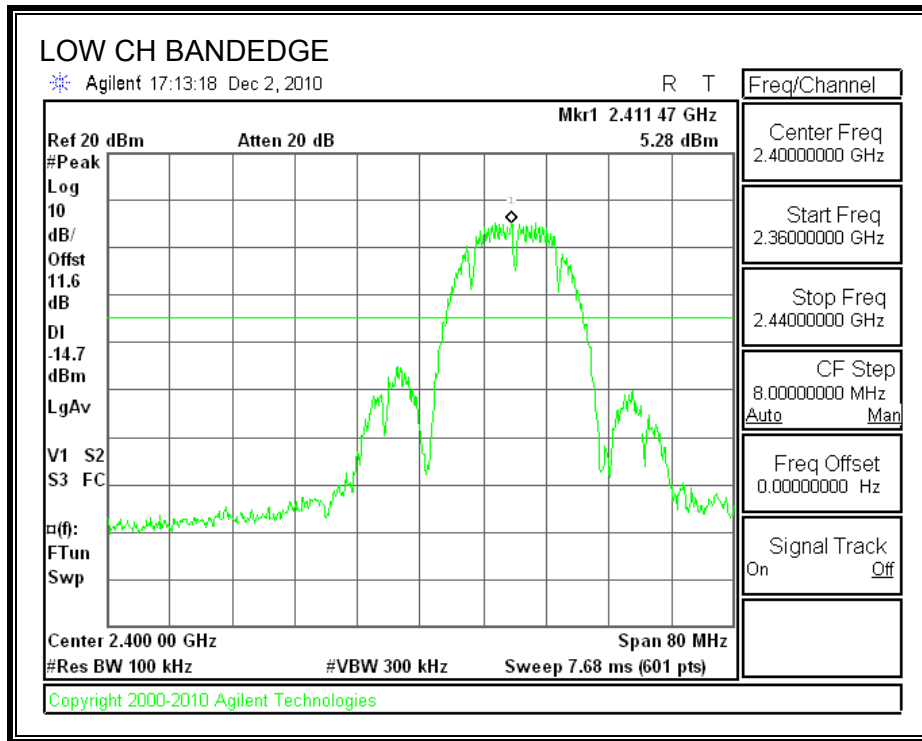
### TEST PROCEDURE

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.

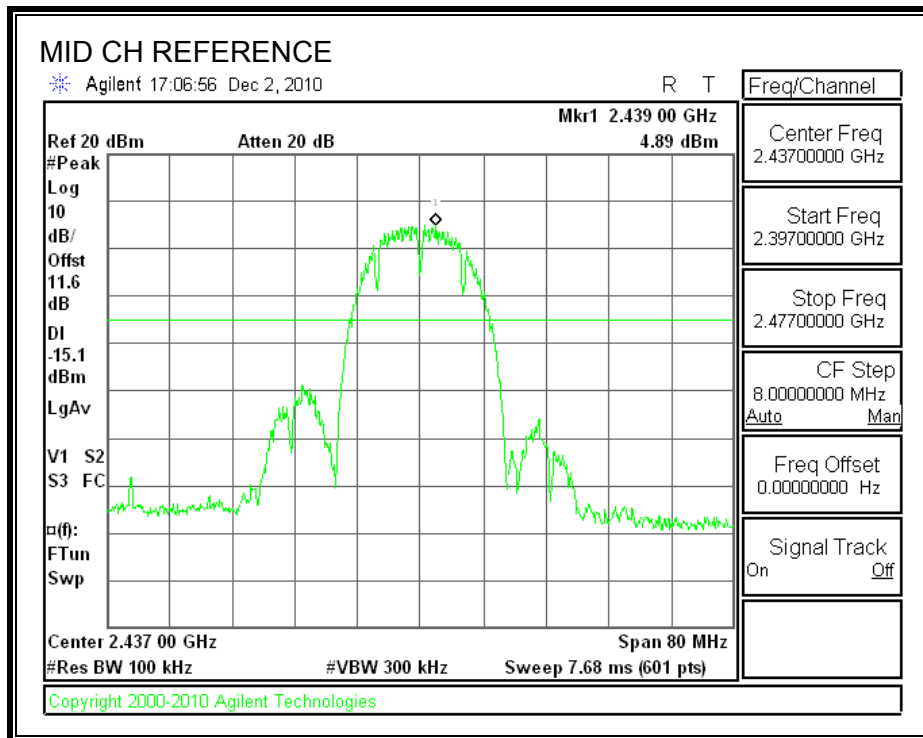
**RESULTS**

**SPURIOUS EMISSIONS, LOW CHANNEL**



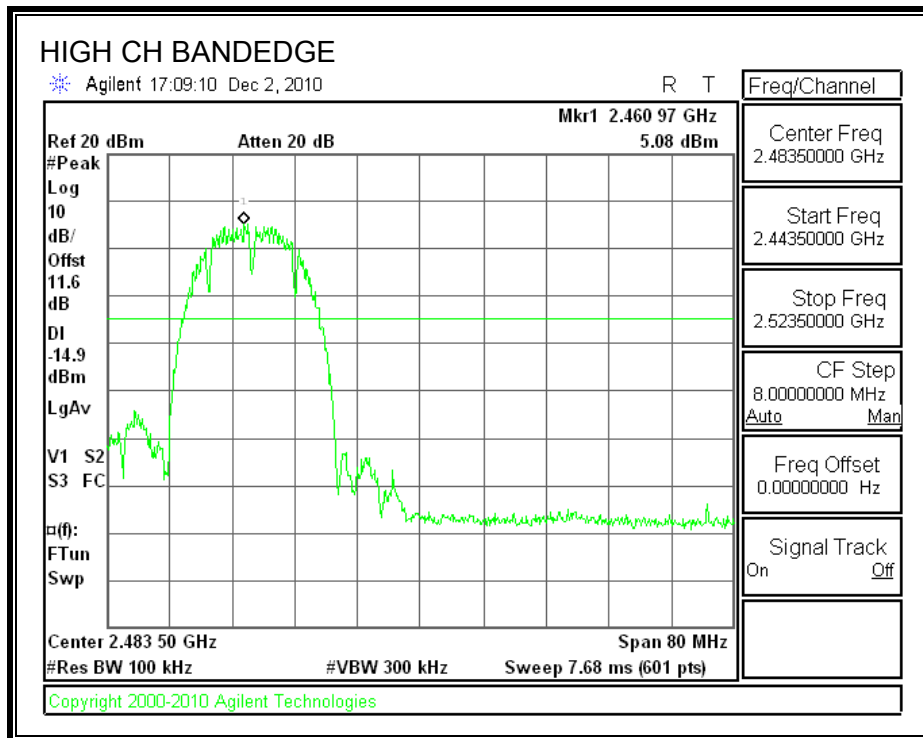


**SPURIOUS EMISSIONS, MID CHANNEL**





**SPURIOUS EMISSIONS, HIGH CHANNEL**





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

### 7.2.1. 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

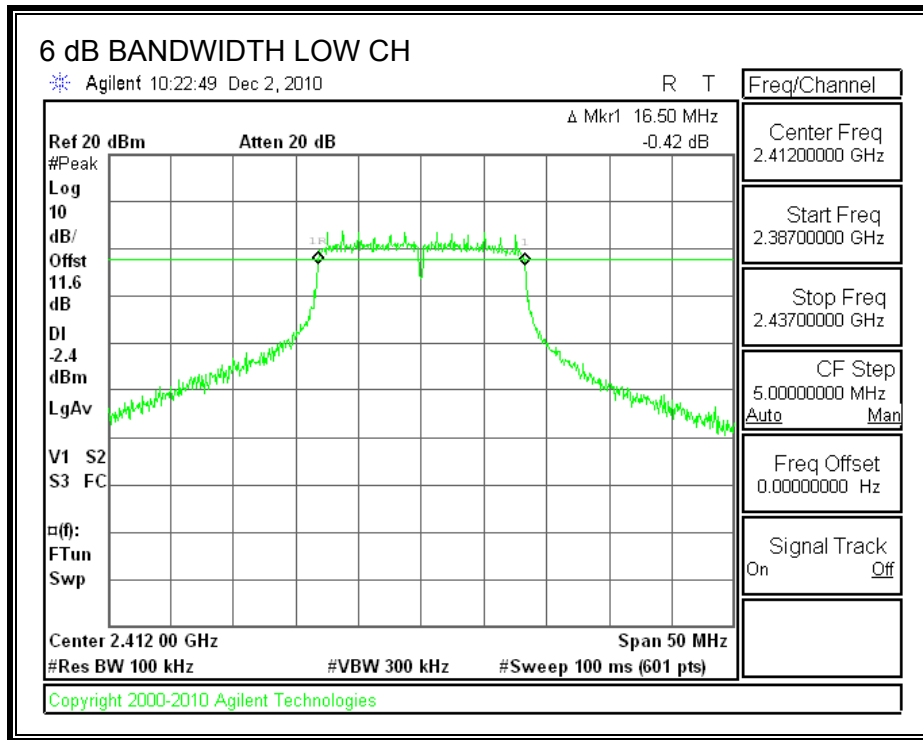
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

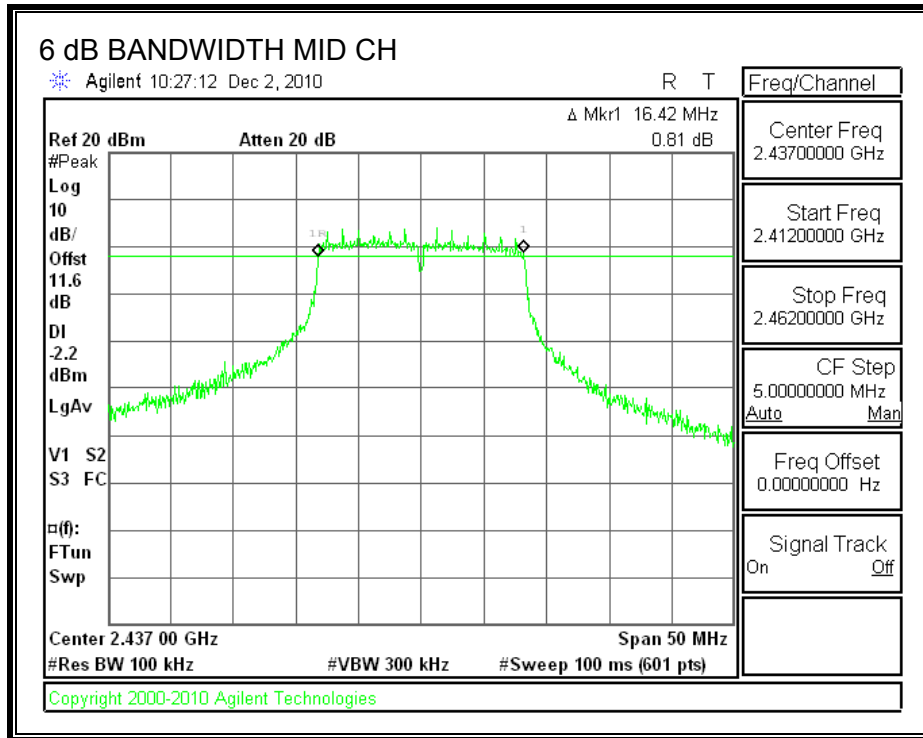
#### RESULTS

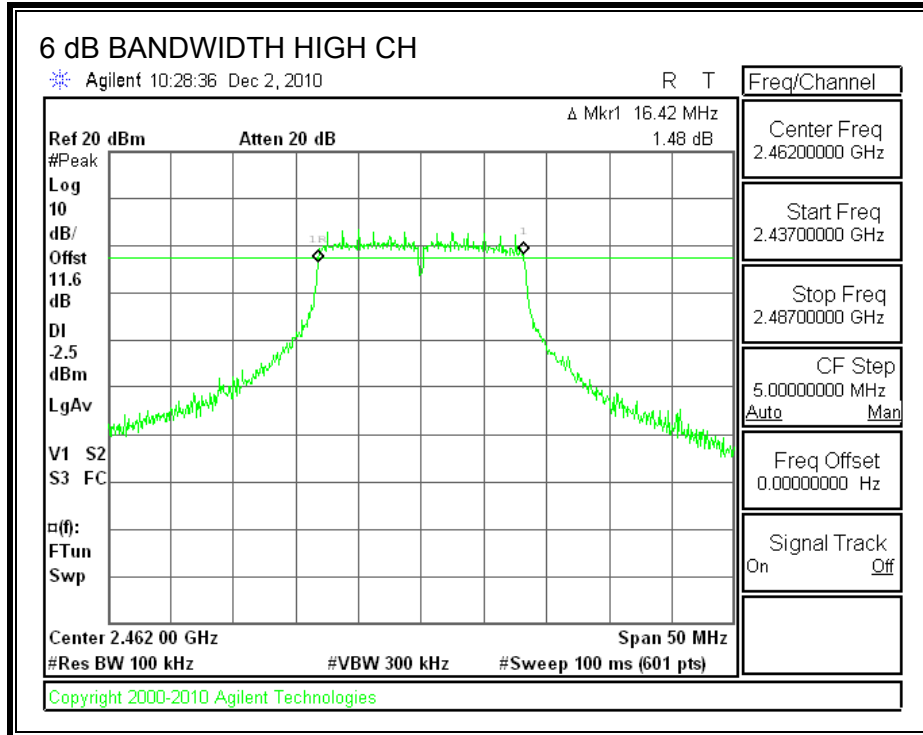
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.5	0.5
Middle	2437	16.42	0.5
High	2462	16.42	0.5



**6 dB BANDWIDTH**







## 7.2.2. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

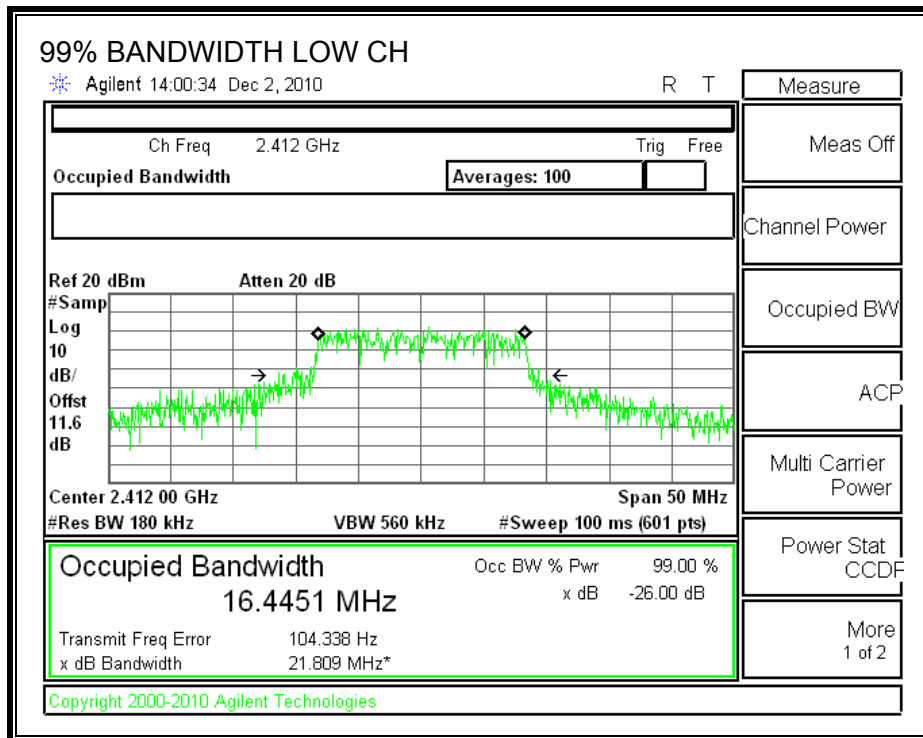
### TEST PROCEDURE

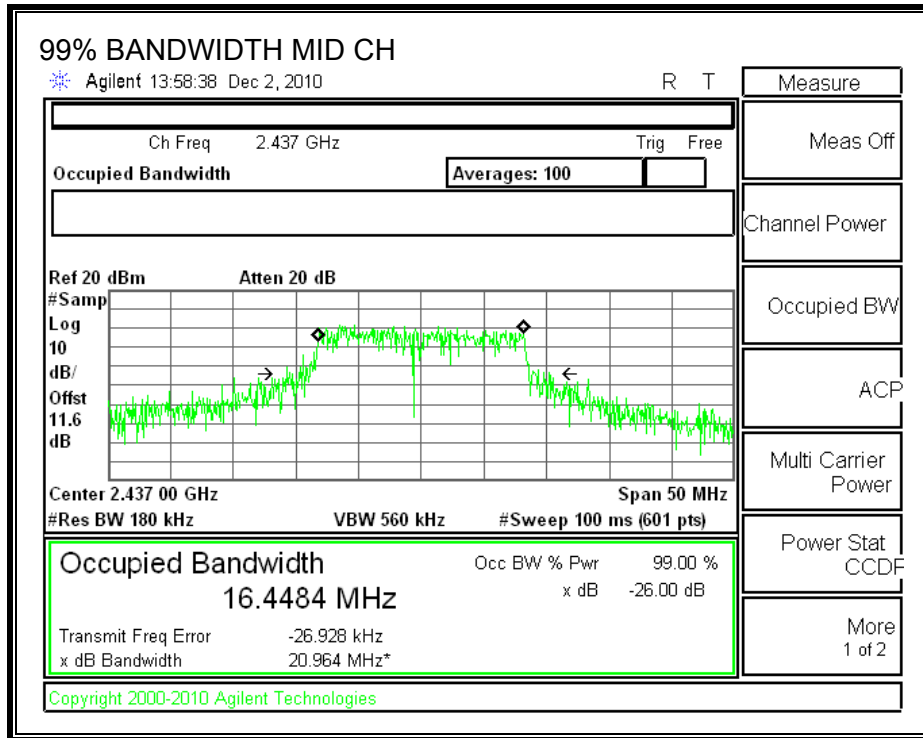
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

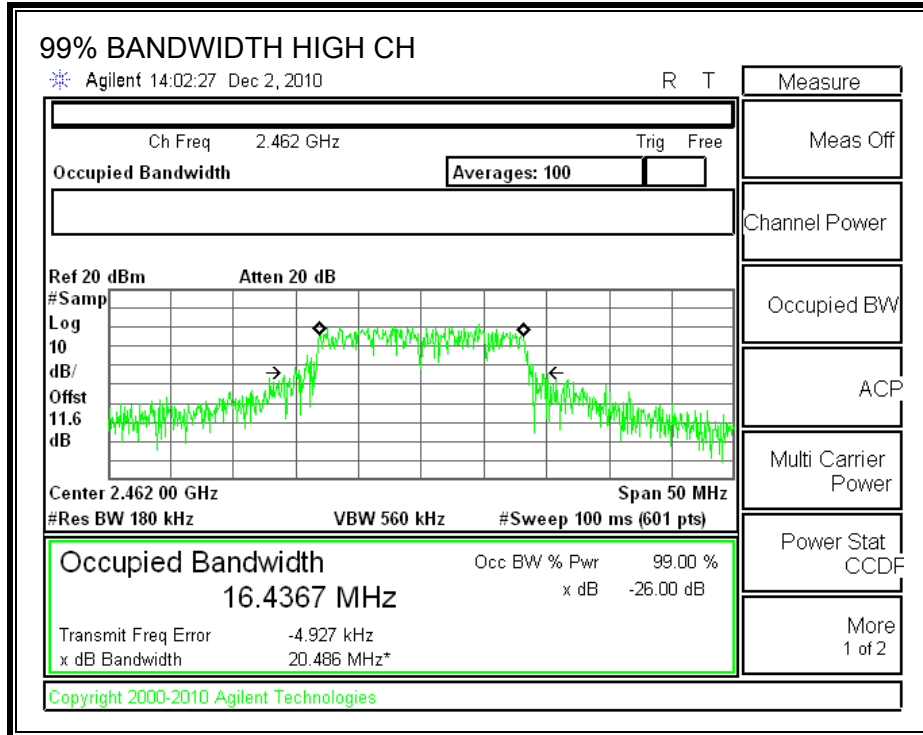
### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.4451
Middle	2437	16.4484
High	2462	16.4367

**99% BANDWIDTH**







### 7.2.3. PEAK 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 11.6 dB (including 10 dB pad and 1.6 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	20.98
Middle	2437	21.24
High	2462	20.32



## 7.2.4. 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 11.6 dB (including 10 dB pad and 1.6 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	15.23
Middle	2437	15.09
High	2462	14.92

## 7.2.5. 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.

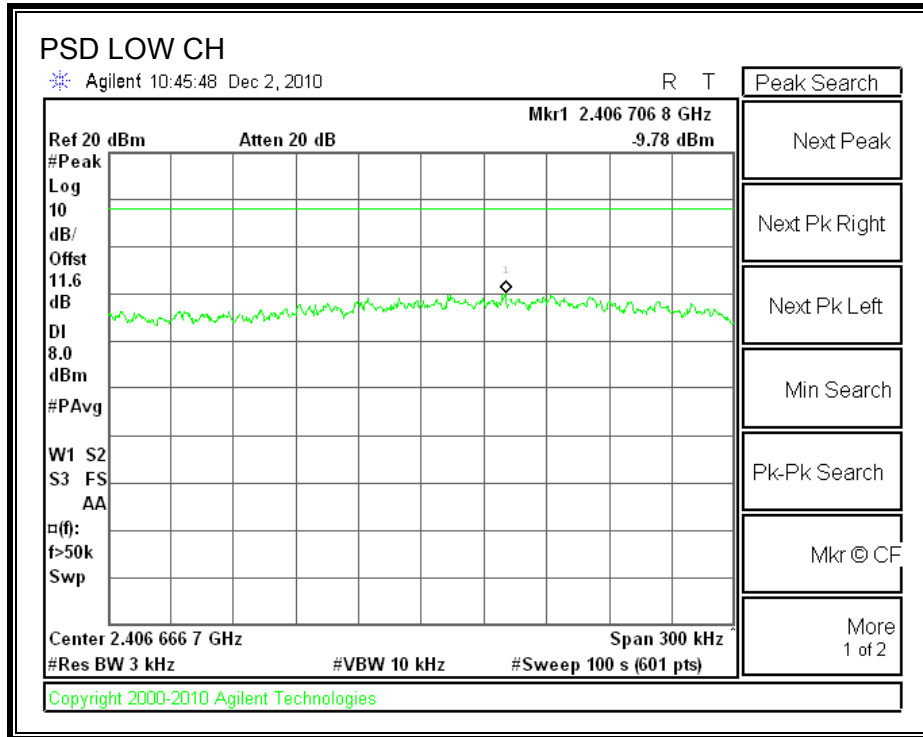
### TEST PROCEDURE

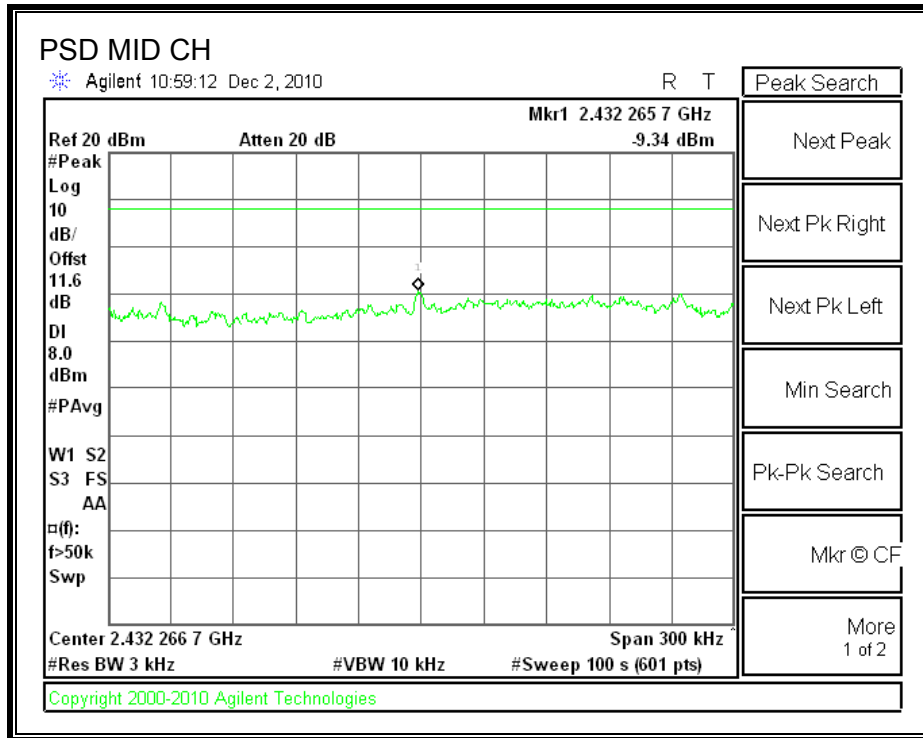
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

### RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-9.78	8	-17.78
Middle	2437	-9.34	8	-17.34
High	2462	-10.17	8	-18.17

**POWER SPECTRAL DENSITY**







## **7.2.6. 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.

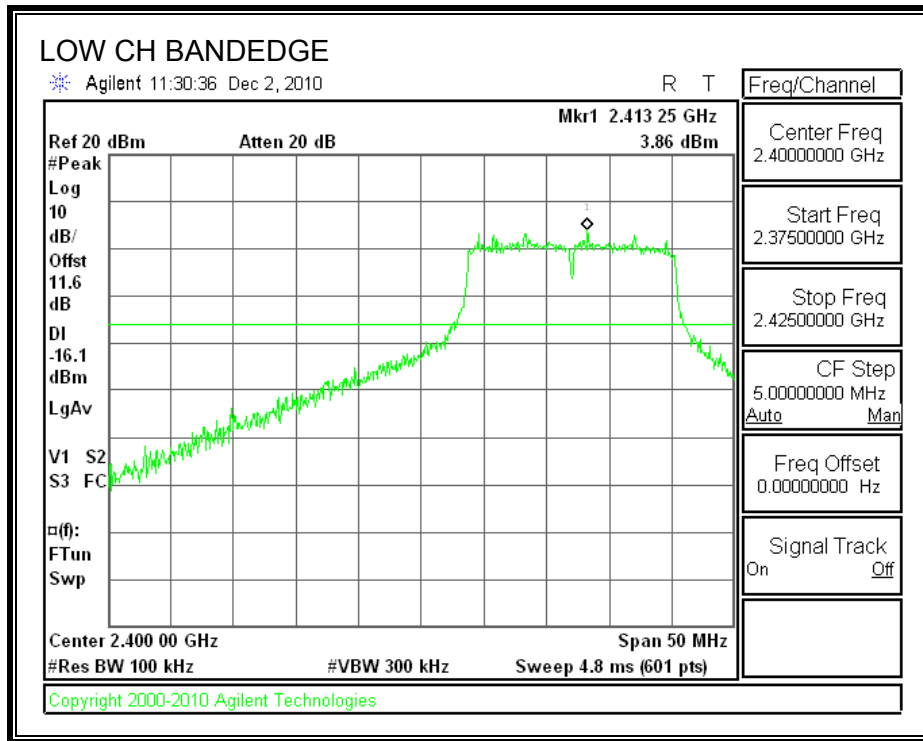
### **TEST PROCEDURE**

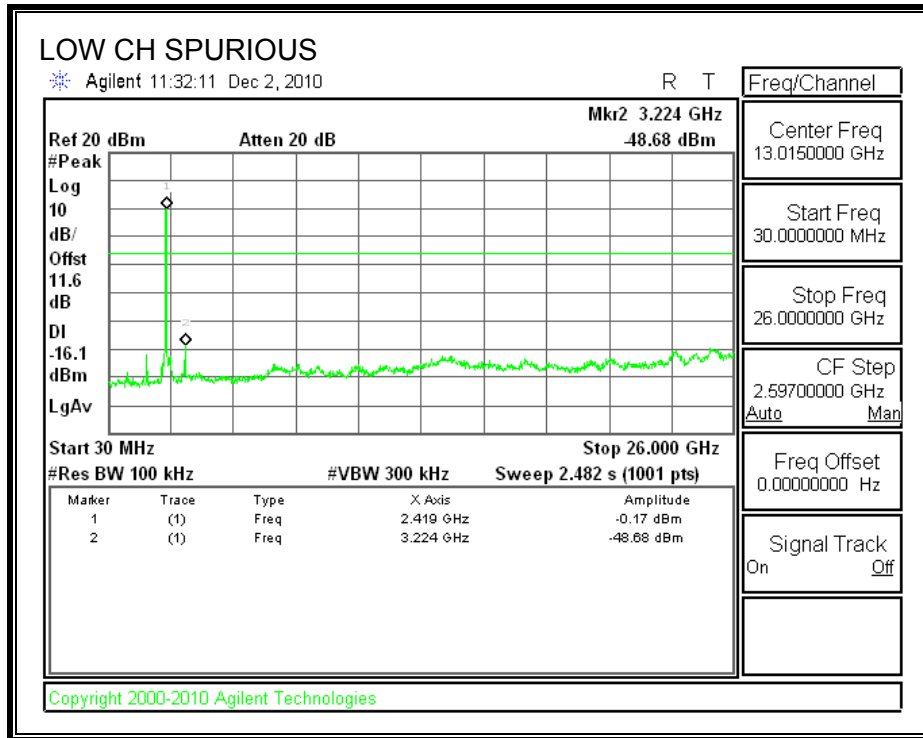
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

**RESULTS**

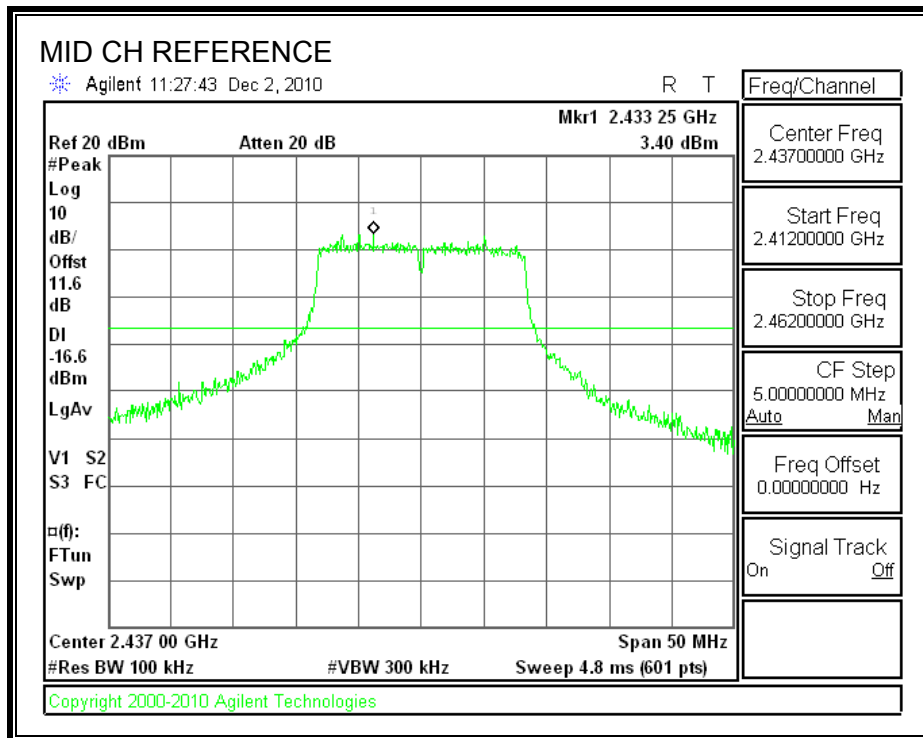
**SPURIOUS EMISSIONS, LOW CHANNEL**

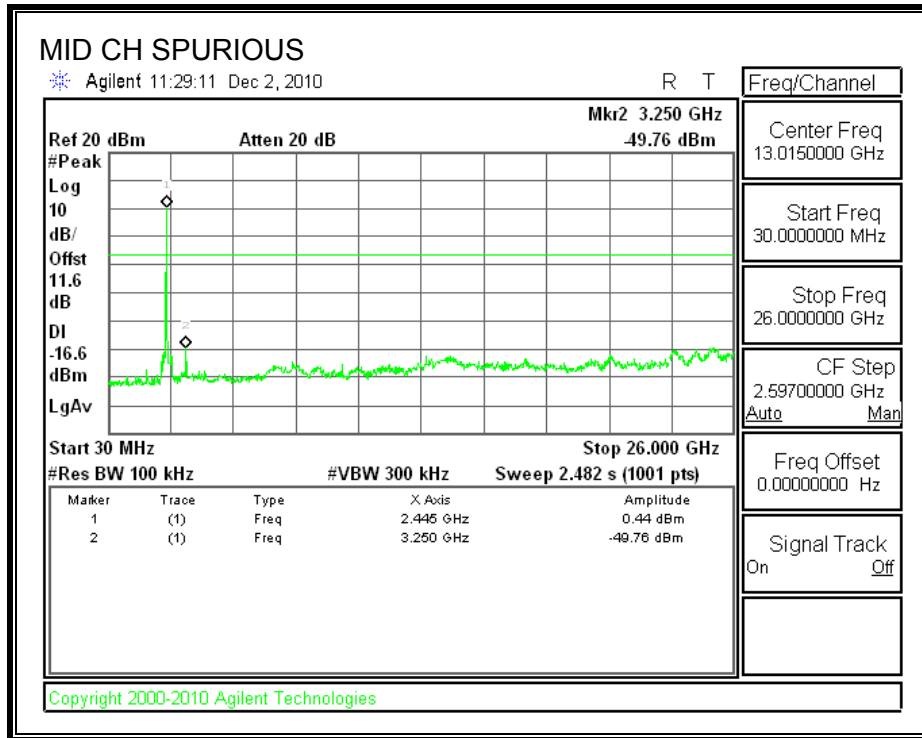




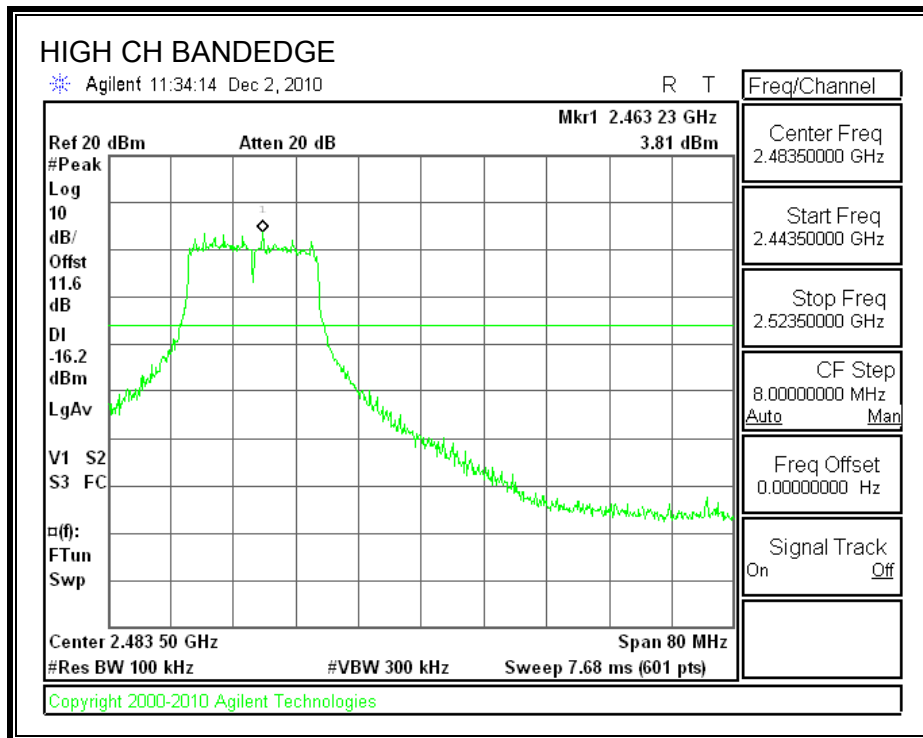


**SPURIOUS EMISSIONS, MID CHANNEL**





**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.

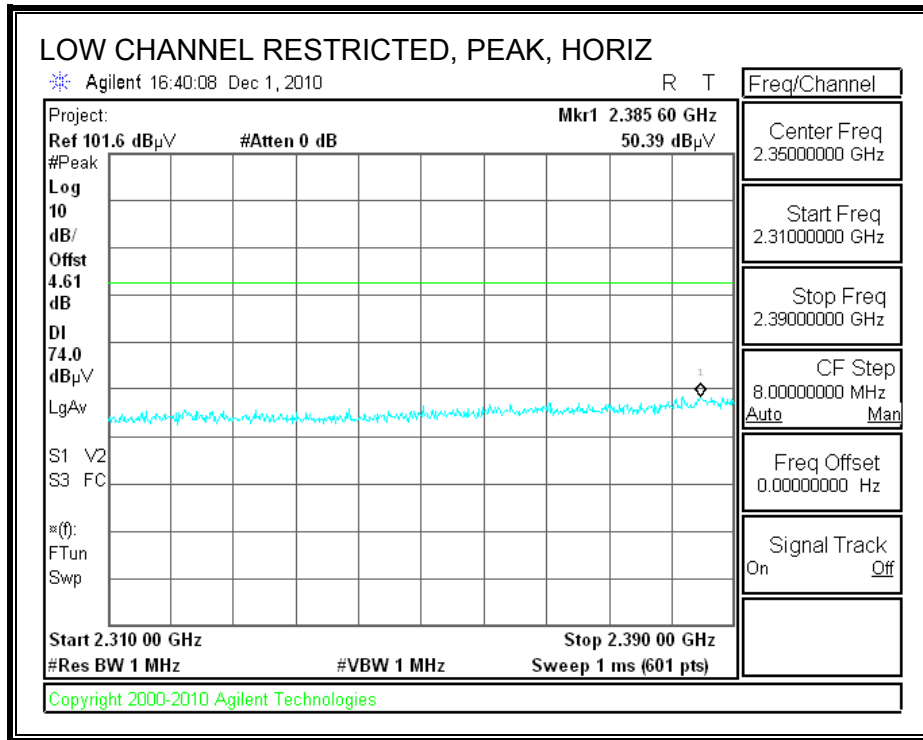
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

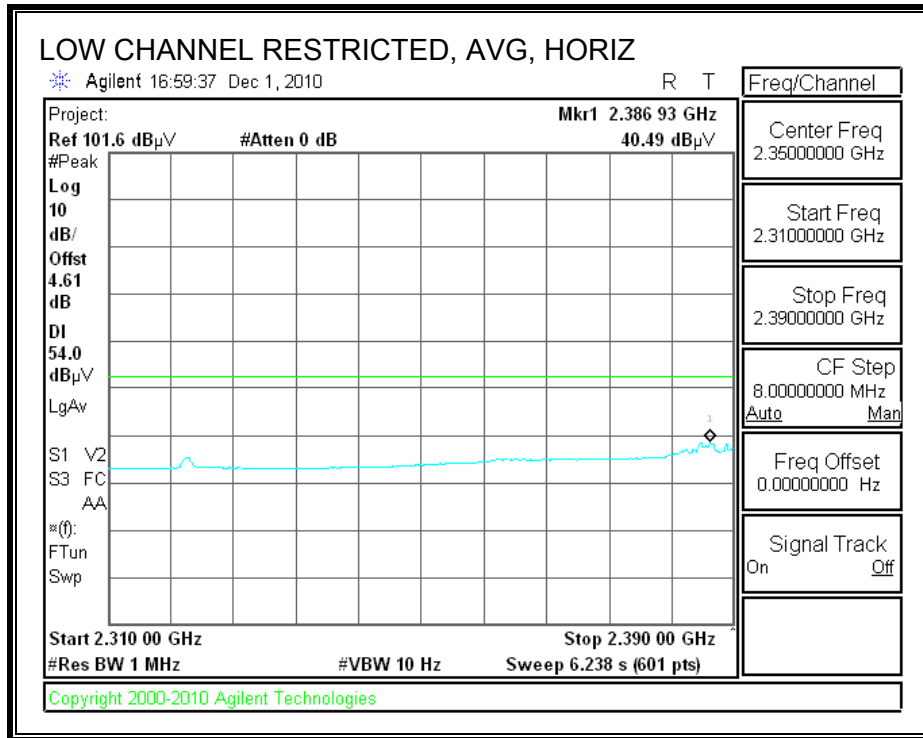
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

## 8.2. TRANSMITTER ABOVE 1 GHz

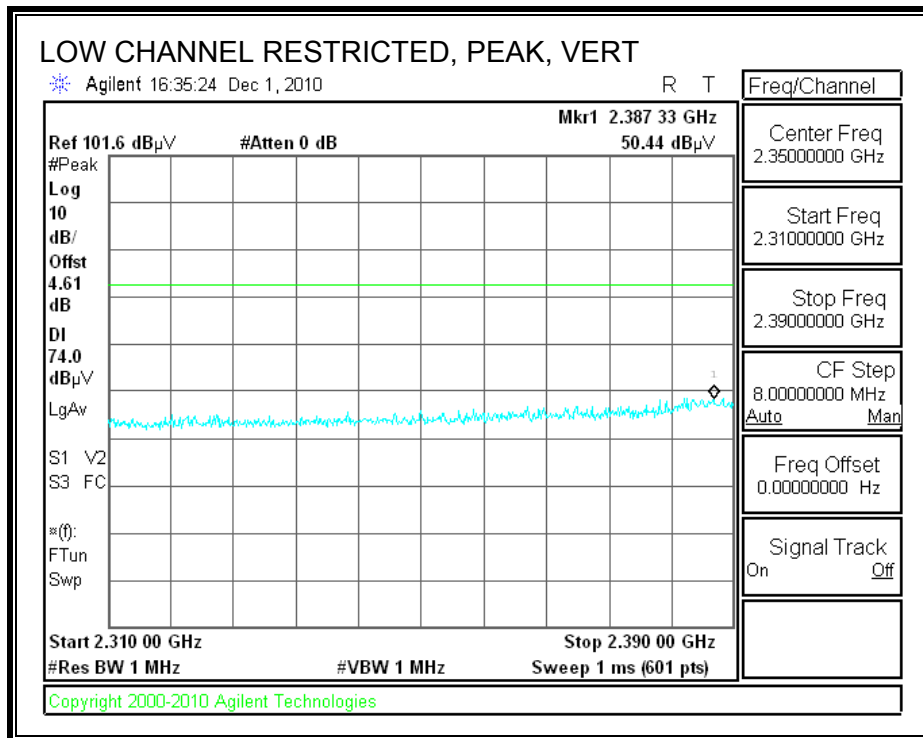
### 8.2.1. TX ABOVE 1 GHz FOR 802.11b MODE IN THE 2.4 GHz BAND

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

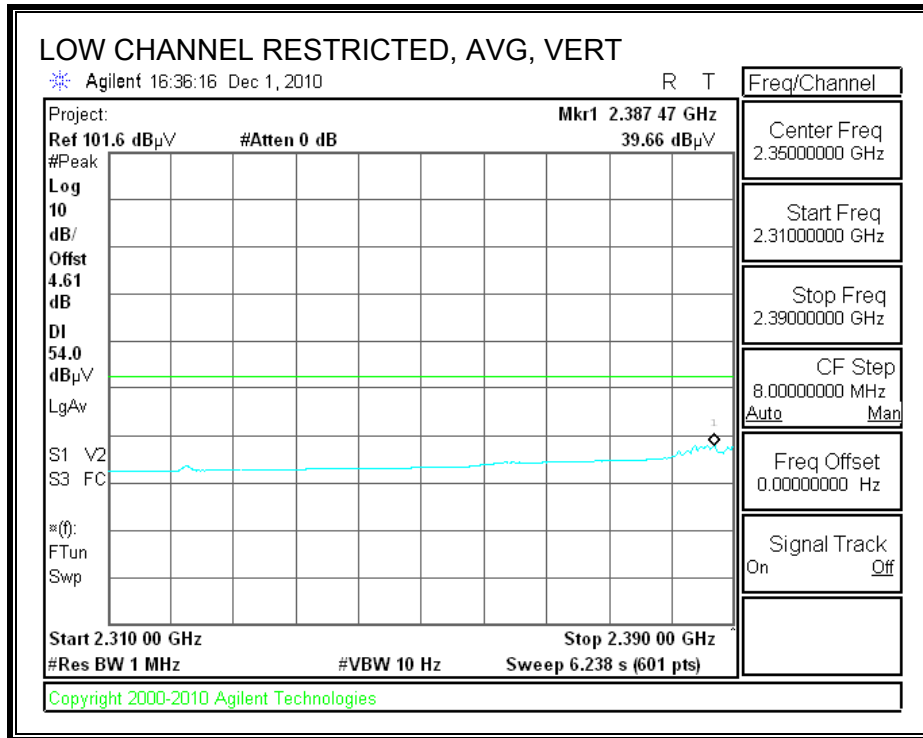




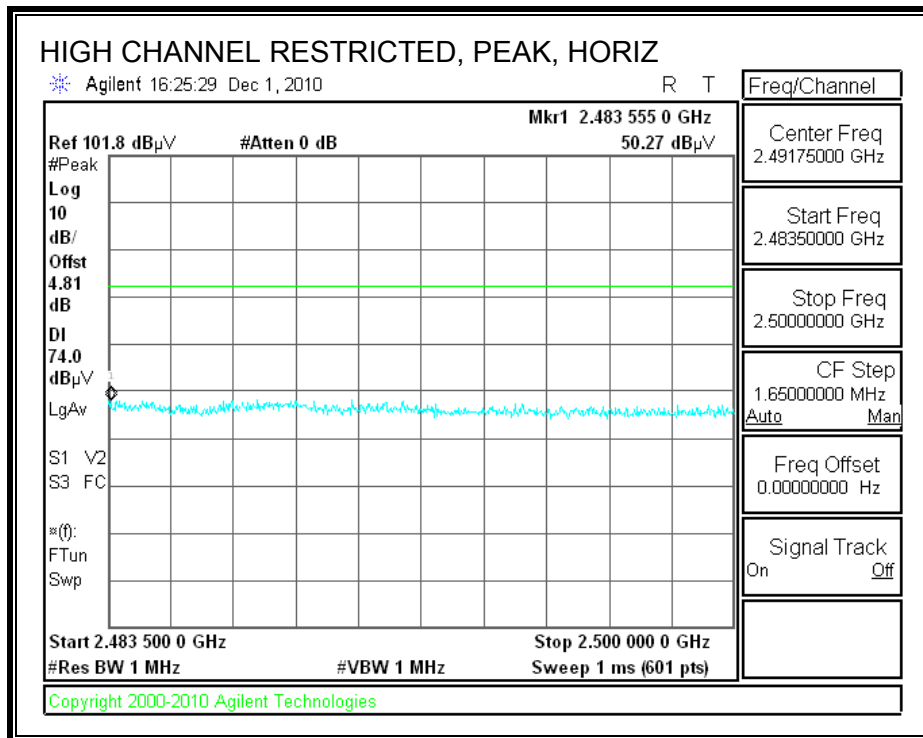
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

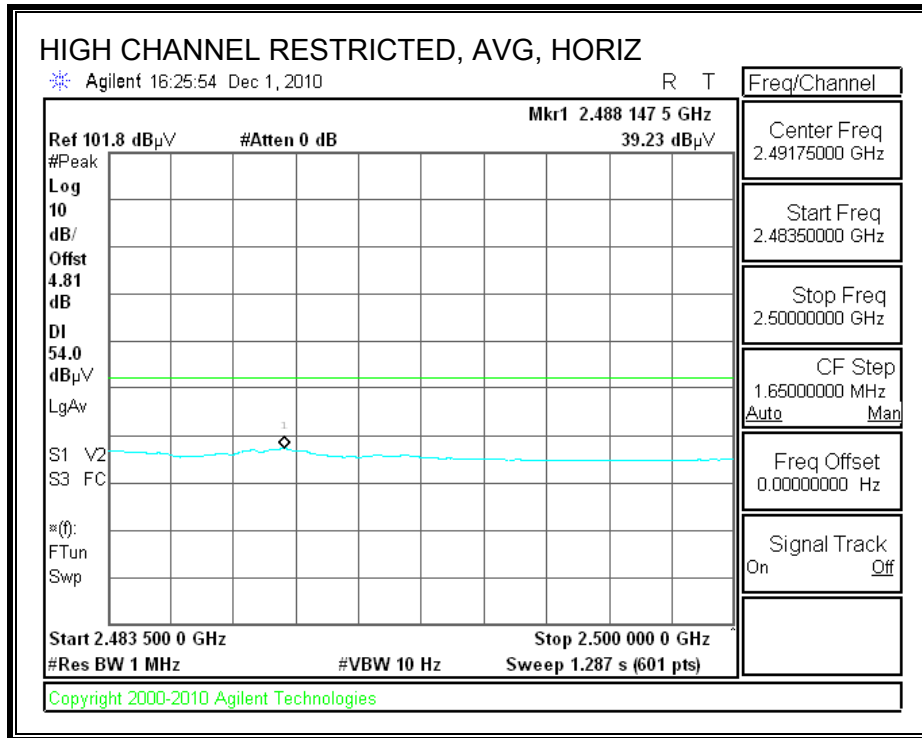




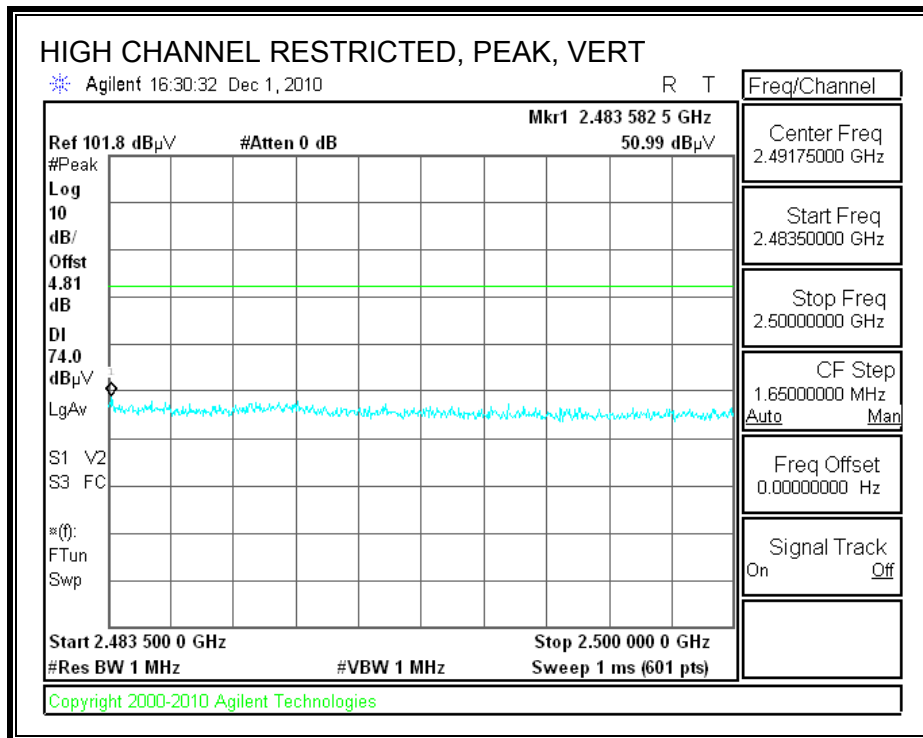


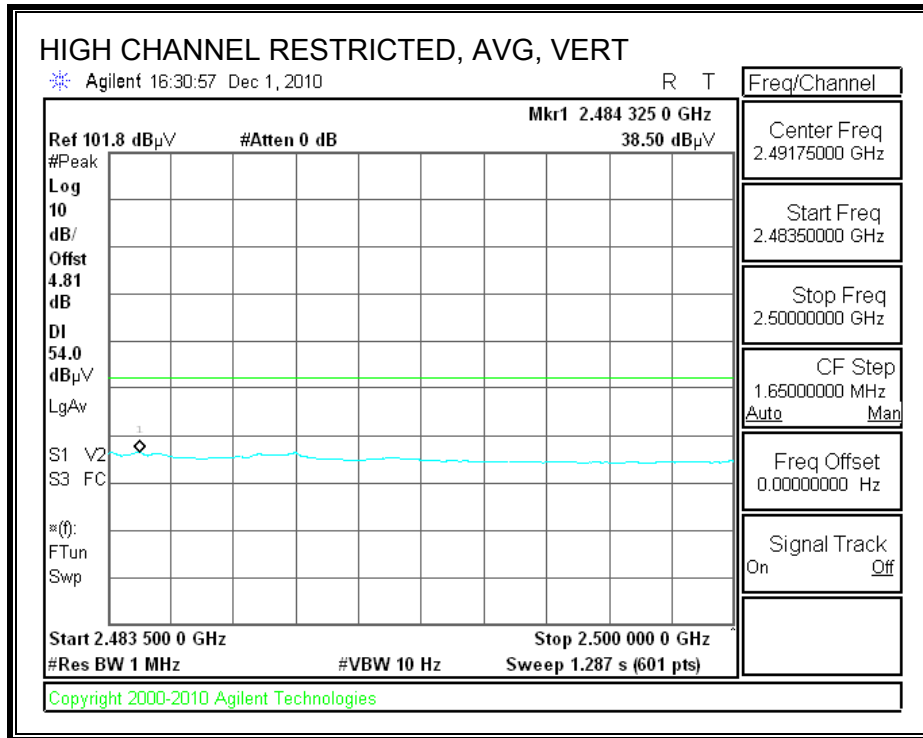
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





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



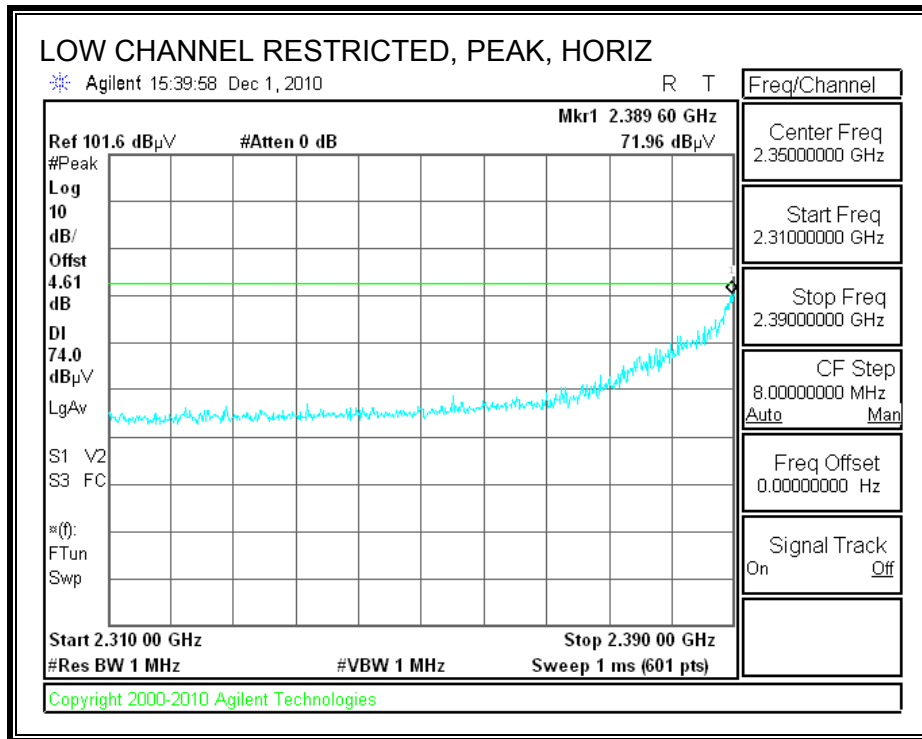


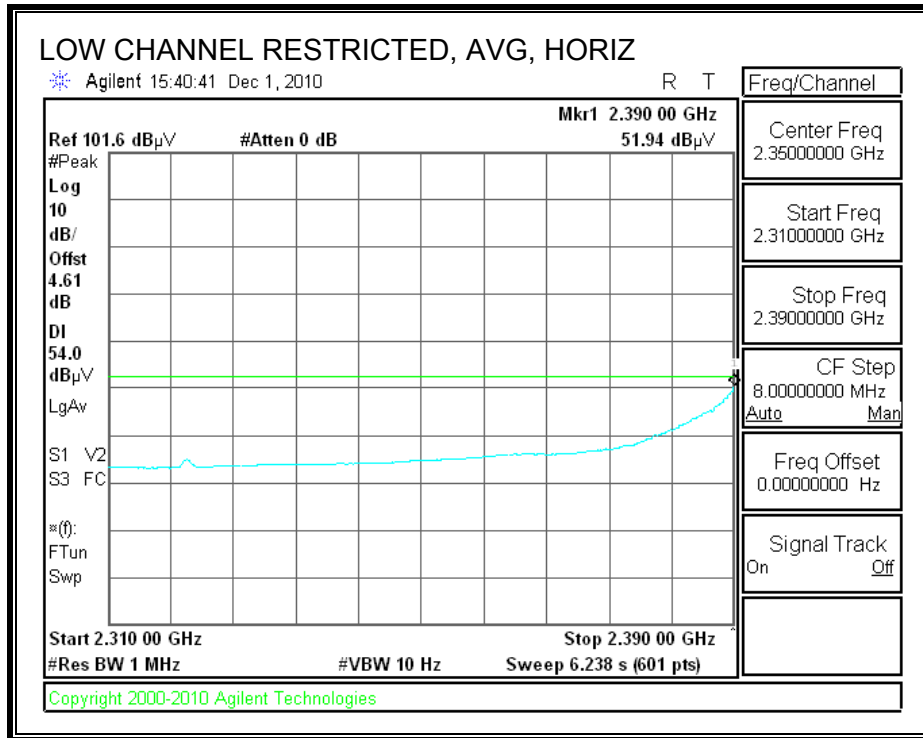
**HARMONICS AND SPURIOUS EMISSIONS**

High Frequency Measurement																	
Compliance Certification Services, Fremont 5m Chamber																	
Company:		Primex Wireless															
Project #:		10U13541															
Date:		12/1/2010															
Test Engineer:		Thanh Nguyen															
Configuration:		EUT only															
Mode:		Transmit b 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									FCC 15.205					
Hi Frequency Cables																	
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			Peak Measurements		
			12' cable 22807600			20' cable 22807500						R_001			RBW=VBW=1MHz		
Average Measurements																	
RBW=1MHz; VBW=10Hz																	
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filt 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>																	
4.824	3.0	47.3	42.6	33.0	5.2	-36.5	0.0	0.0	49.1	44.4	74	54	-24.9	-9.6	V		
4.824	3.0	47.6	44.8	33.0	5.2	-36.5	0.0	0.0	49.4	46.6	74	54	-24.6	-7.4	H		
12.060	3.0	35.8	23.2	39.0	8.8	-35.4	0.0	0.0	48.1	35.5	74	54	-25.9	-18.5	Noise floor		
<b>Mid ch</b>																	
4.874	3.0	51.6	49.0	33.1	5.3	-36.5	0.0	0.0	53.5	50.9	74	54	-20.5	-3.1	V		
7.311	3.0	41.8	33.7	35.3	6.5	-36.2	0.0	0.0	47.4	39.3	74	54	-26.6	-14.7	V		
4.874	3.0	51.3	49.6	33.1	5.3	-36.5	0.0	0.0	53.2	51.5	74	54	-20.8	-2.5	H		
7.311	3.0	41.3	34.6	35.3	6.5	-36.2	0.0	0.0	46.9	40.2	74	54	-27.1	-13.8	H		
<b>High Ch</b>																	
4.924	3.0	51.9	49.2	33.1	5.3	-36.5	0.0	0.0	53.9	51.2	74	54	-20.1	-2.8	V		
7.386	3.0	41.4	33.2	35.4	6.6	-36.2	0.0	0.0	47.1	39.0	74	54	-26.9	-15.0	V		
4.924	3.0	52.3	49.4	33.1	5.3	-36.5	0.0	0.0	54.3	51.4	74	54	-19.7	-2.6	H		
7.386	3.0	39.6	30.1	35.4	6.6	-36.2	0.0	0.0	45.4	35.8	74	54	-28.6	-18.2	H		
12.310	3.0	36.3	23.1	39.0	8.9	-35.4	0.0	0.0	48.8	35.5	74	54	-25.2	-18.5	Noise floor		
Rev. 07.22.09																	
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										

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

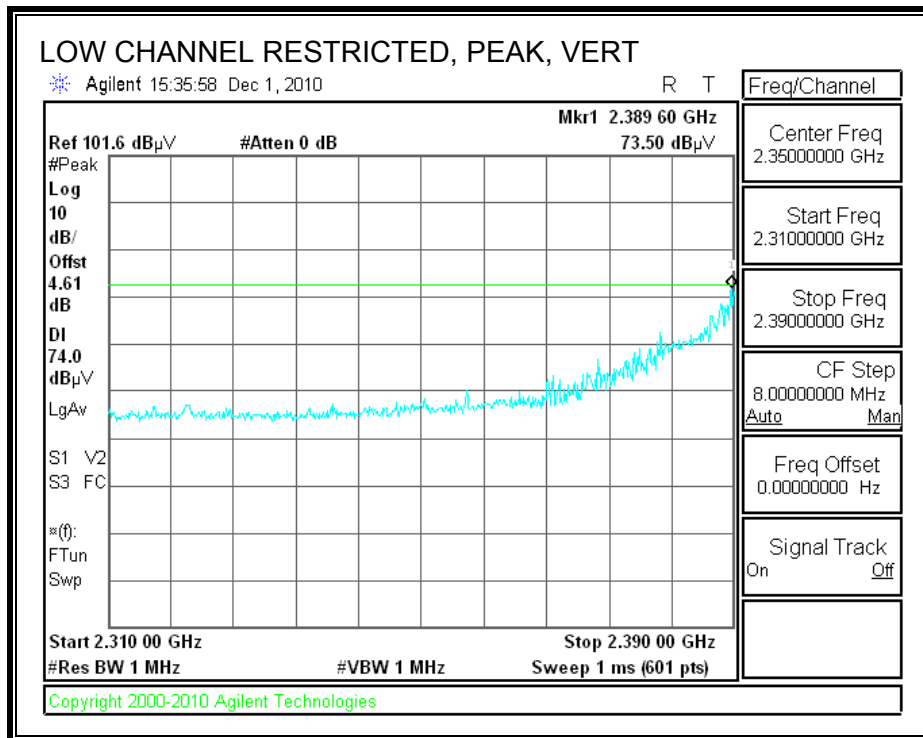
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

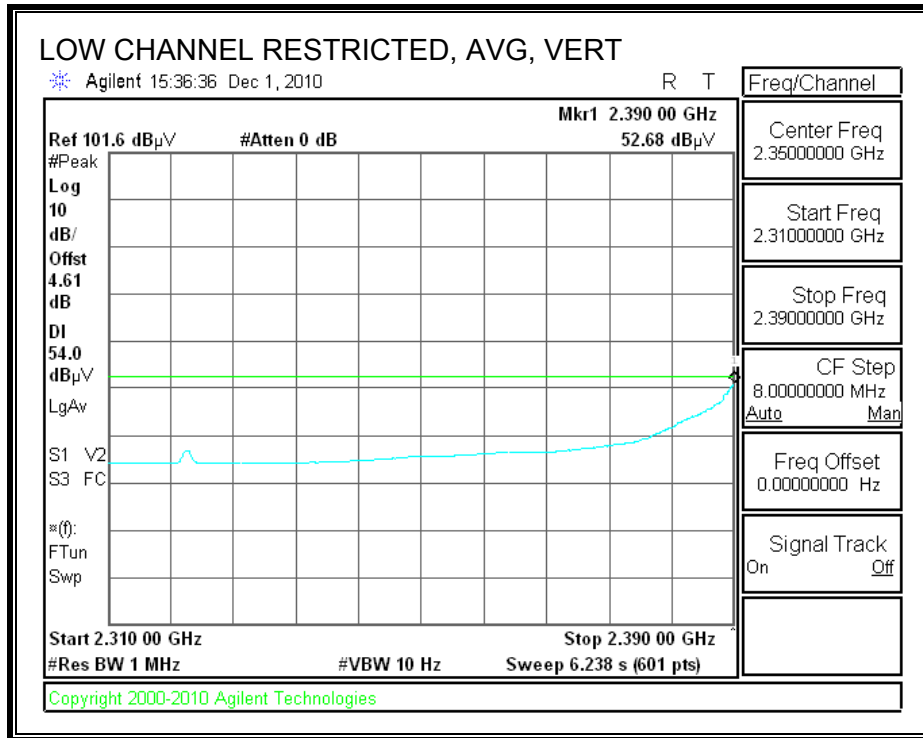




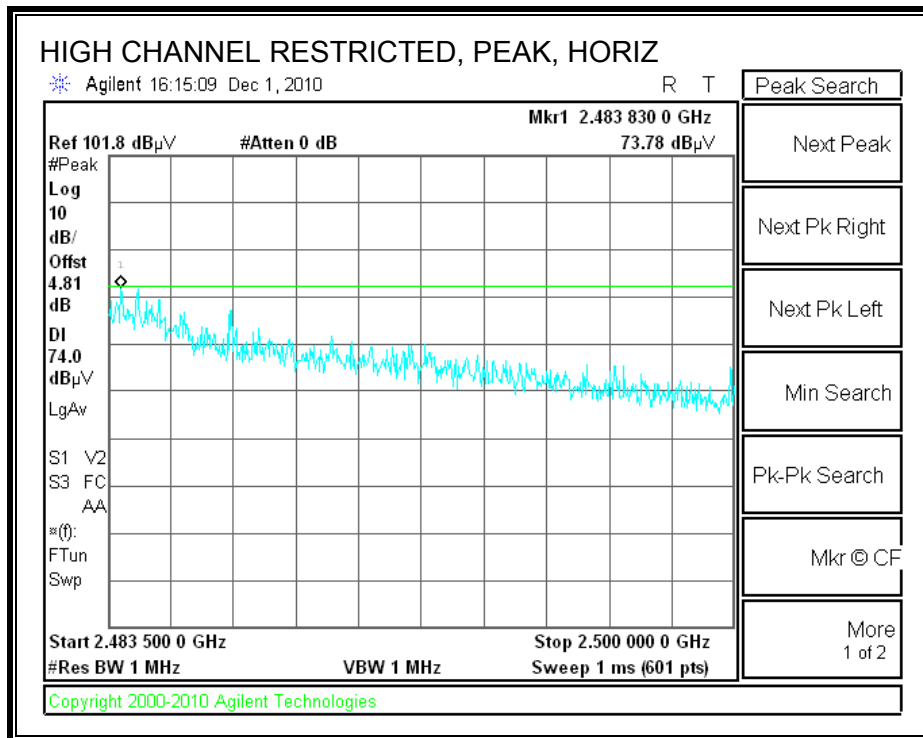


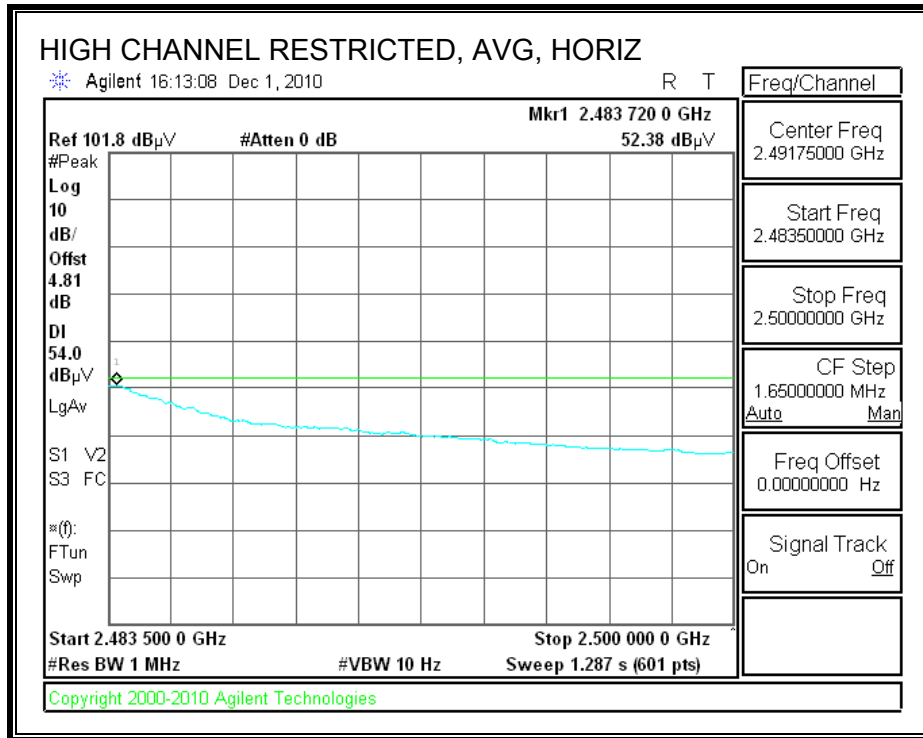
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



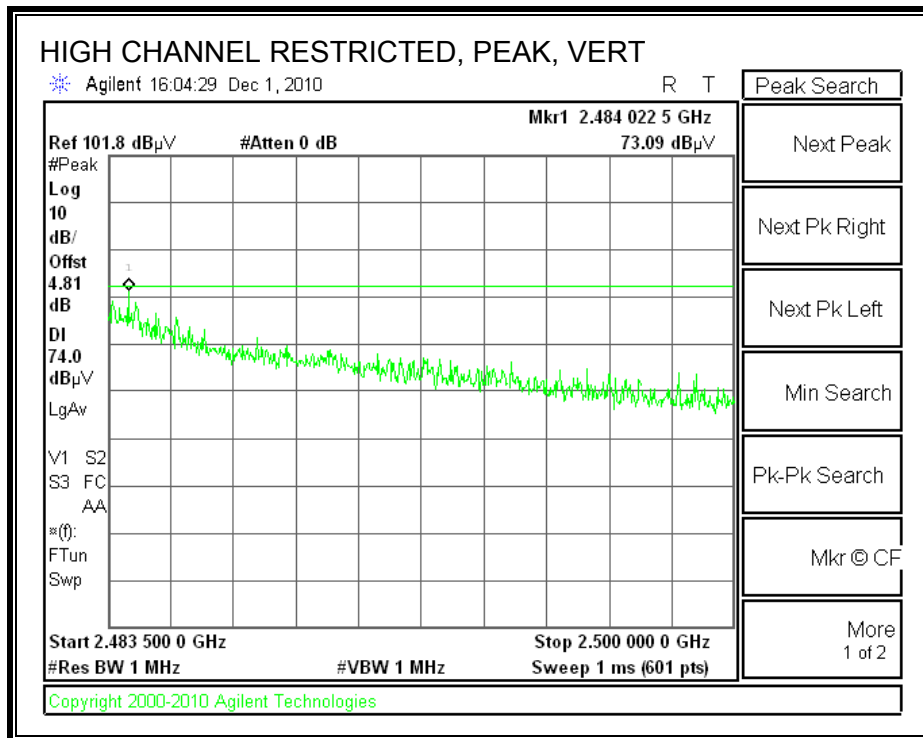


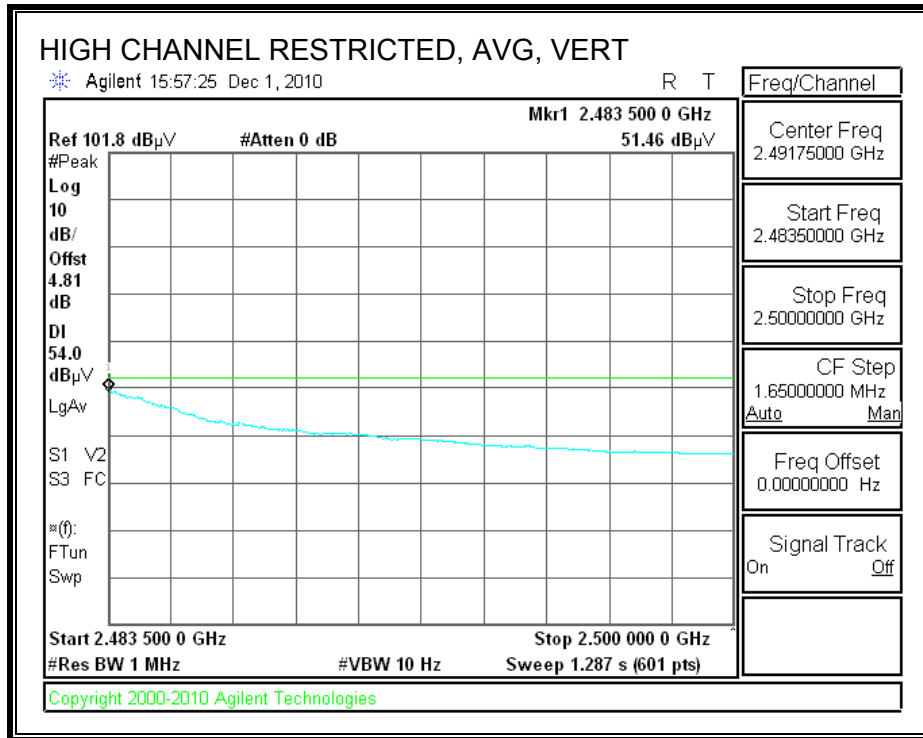
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





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





**HARMONICS AND SPURIOUS EMISSIONS**

High Frequency Measurement																	
Compliance Certification Services, Fremont 5m Chamber																	
Company:		Primex Wireless															
Project #:		10U13541															
Date:		12/1/2010															
Test Engineer:		Thanh Nguyen															
Configuration:		EUT only															
Mode:		Transmit g 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									FCC 15.205					
Hi Frequency Cables																	
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			Peak Measurements RBW=VBW=1MHz		
			12' cable 22807600			20' cable 22807500						R_001			Average Measurements RBW=1MHz; VBW=10Hz		
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filt 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>																	
4.824	3.0	48.7	35.3	33.0	5.2	-36.5	0.0	0.0	50.5	37.1	74	54	-23.5	-16.9	V		
4.824	3.0	49.0	37.2	33.0	5.2	-36.5	0.0	0.0	50.8	39.0	74	54	-23.2	-15.0	H		
12.060	3.0	36.2	23.5	39.0	8.8	-35.4	0.0	0.0	48.6	35.8	74	54	-25.4	-18.2	Noise floor		
<b>Mid ch</b>																	
4.874	3.0	50.3	36.8	33.1	5.3	-36.5	0.0	0.0	52.2	38.7	74	54	-21.8	-15.3	V		
7.311	3.0	50.7	34.2	35.3	6.5	-36.2	0.0	0.0	56.4	39.8	74	54	-17.6	-14.2	V		
4.874	3.0	50.4	36.8	33.1	5.3	-36.5	0.0	0.0	52.3	38.7	74	54	-21.7	-15.3	H		
7.311	3.0	52.8	35.8	35.3	6.5	-36.2	0.0	0.0	58.4	41.4	74	54	-15.6	-12.6	H		
<b>High Ch</b>																	
4.924	3.0	51.1	38.9	33.1	5.3	-36.5	0.0	0.0	53.1	40.9	74	54	-20.9	-13.1	V		
7.386	3.0	47.4	31.5	35.4	6.6	-36.2	0.0	0.0	53.2	37.2	74	54	-20.8	-16.8	V		
4.924	3.0	49.2	35.3	33.1	5.3	-36.5	0.0	0.0	51.2	37.3	74	54	-22.8	-16.7	H		
7.386	3.0	53.5	36.6	35.4	6.6	-36.2	0.0	0.0	59.3	42.3	74	54	-14.7	-11.7	H		
12.310	3.0	34.7	23.1	39.0	8.9	-35.4	0.0	0.0	47.2	35.6	74	54	-26.8	-18.4	Noise floor		
Rev. 07.22.09																	
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										

### 8.3. RECEIVER ABOVE 1 GHz

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

Company: Primex Wireless  
 Project #: 10U13541  
 Date: 12/1/2010  
 Test Engineer: Thanh Nguyen  
 Configuration: EUT only  
 Mode: Receive 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 RBW=VBW=1MHz
	12' cable 22807600	20' cable 22807500		R_001	Average Measurements RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.000	3.0	52.8	50.8	23.9	2.1	-39.5	0.0	0.0	39.3	37.3	74	54	-34.7	-16.7	V
1.250	3.0	50.2	44.7	24.7	2.4	-39.1	0.0	0.0	38.2	32.7	74	54	-35.8	-21.3	V
1.380	3.0	48.5	35.9	25.1	2.5	-38.9	0.0	0.0	37.2	24.6	74	54	-36.8	-29.4	V
1.500	3.0	46.1	35.0	25.5	2.7	-38.8	0.0	0.0	35.5	24.5	74	54	-38.5	-29.5	V
1.000	3.0	55.1	50.6	23.9	2.1	-39.5	0.0	0.0	41.6	37.1	74	54	-32.4	-16.9	H
1.250	3.0	51.6	43.8	24.7	2.4	-39.1	0.0	0.0	39.6	31.7	74	54	-34.4	-22.3	H
1.290	3.0	50.7	42.6	24.8	2.4	-39.1	0.0	0.0	38.9	30.8	74	54	-35.1	-23.2	H
1.380	3.0	51.2	36.4	25.1	2.5	-38.9	0.0	0.0	39.9	25.1	74	54	-34.1	-28.9	H

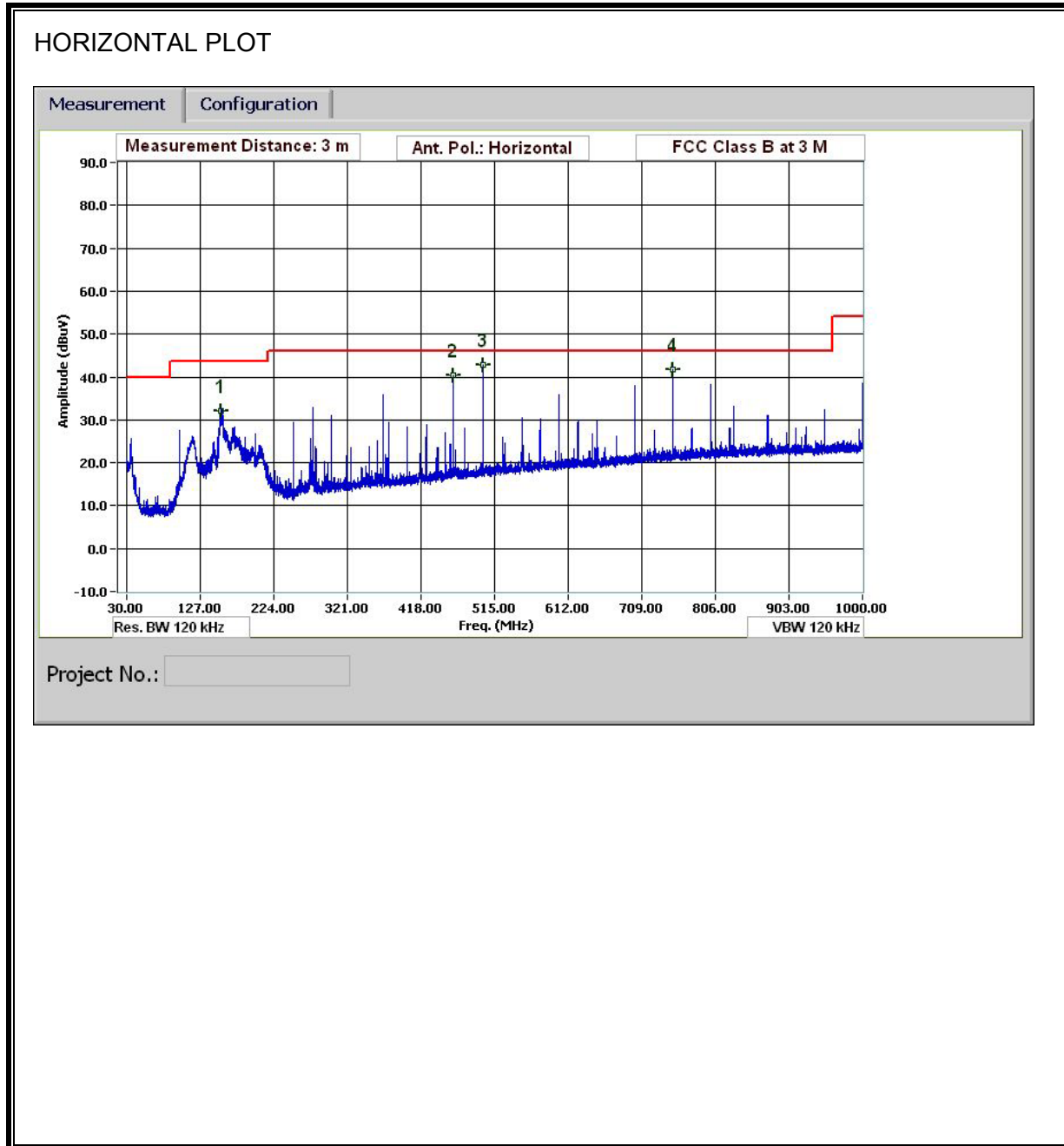
Rev. 07.22.09

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		

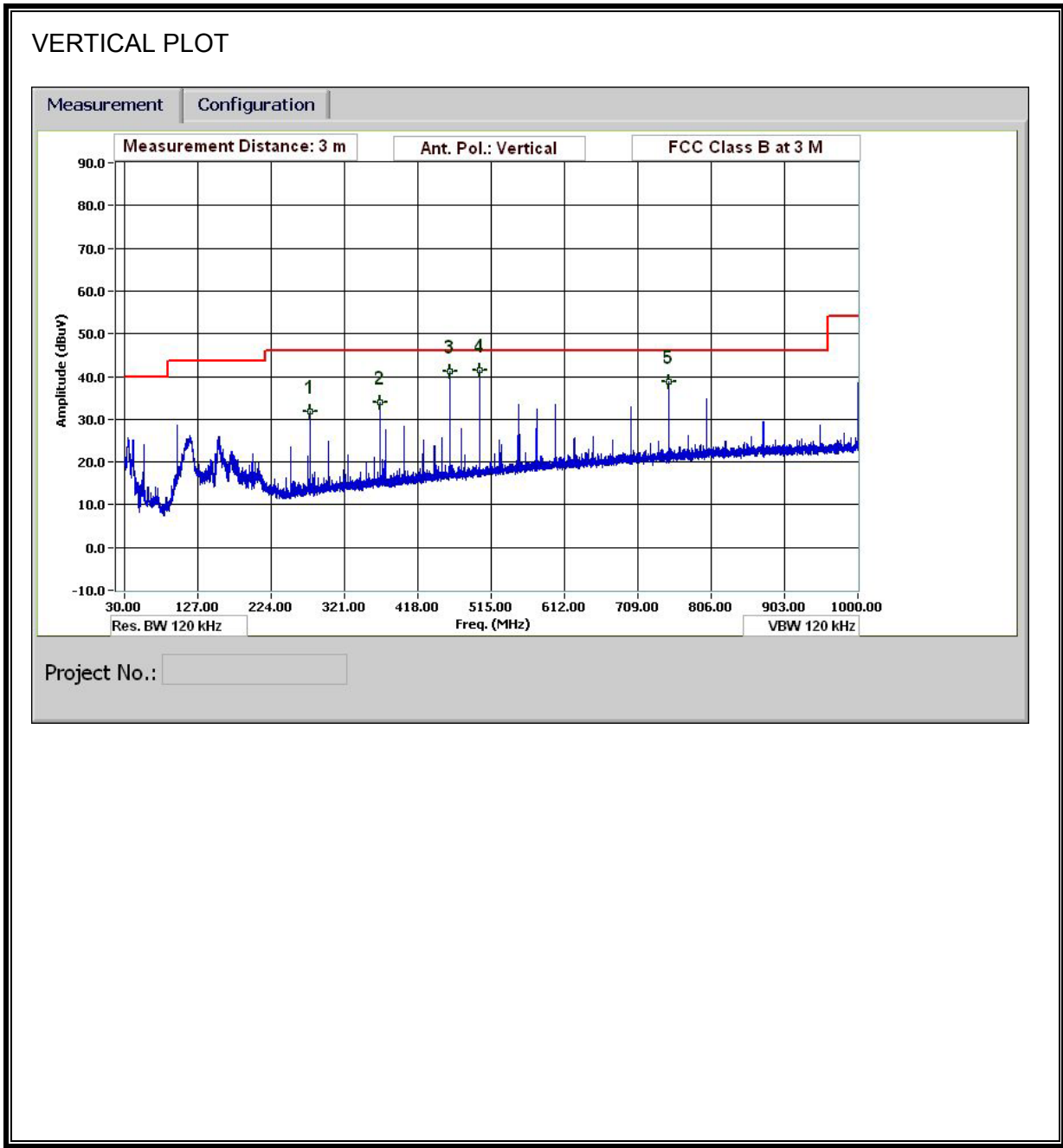


### 8.4. WORST-CASE BELOW 1 GHz

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



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



**EMI DATA**

30-1000MHz Frequency Measurement															
Compliance Certification Services, Fremont 5m Chamber															
Test Engr:		Thanh Nguyen													
Date:		12/01/10													
Project #:		10U13541													
Company:		Primex Wireless													
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 MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Pad 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>Tx worst case</b>															
276.01	3.0	45.8	12.6	1.4	28.1	0.0	0.0	31.8	46.0	-14.2	V	P	100.0	0 - 360	
368.054	3.0	45.9	14.4	1.7	28.1	0.0	0.0	33.9	46.0	-12.1	V	P	100.0	0 - 360	
459.978	3.0	51.3	16.0	1.9	27.9	0.0	0.0	41.3	46.0	-4.7	V	P	100.0	0 - 360	
500.059	3.0	50.5	16.7	2.0	27.8	0.0	0.0	41.4	46.0	-4.6	V	P	100.0	0 - 360	
750.03	3.0	43.3	20.3	2.5	27.3	0.0	0.0	38.8	46.0	-7.2	V	P	100.0	0 - 360	
154.205	3.0	47.0	12.2	1.1	28.3	0.0	0.0	32.1	43.5	-11.4	H	P	100.0	0 - 360	
459.978	3.0	50.3	16.0	1.9	27.9	0.0	0.0	40.3	46.0	-5.7	H	P	100.0	0 - 360	
500.059	3.0	51.9	16.7	2.0	27.8	0.0	0.0	42.9	46.0	-3.1	H	P	100.0	0 - 360	
750.15	3.0	46.2	20.3	2.5	27.3	0.0	0.0	41.7	46.0	-4.3	H	P	100.0	0 - 360	
Rev. 1.27.09															
Note: No other emissions were detected above the system noise floor.															

## 9. 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 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m <sup>2</sup> )	5 Averaging Time (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:

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

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.

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 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	WLAN	0.20	21.24	0.00	0.26	0.026