



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

**CERTIFICATION TEST REPORT**

**FOR**

**802.11BG, BT, WWAN COMBO MODULE**

**MODEL NUMBER: FENWAY-2**

**FCC ID: J9CFENWAY-2**

**IC ID: 2723A-FENWAY2**

**REPORT NUMBER: 10U13243-1**

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NVLAP LAB CODE 200065-0

Revision History

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--	06/02/10	Initial Issue	--

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** QUALCOMM CORPORATE  
5775 MOREHOUSE DRIVE  
SAN DIEGO, CA. 92121, UNITED STATES

**EUT DESCRIPTION:** 802.11bg, BT, WWAN Combo Module

**MODEL:** FENWAY-2

**SERIAL NUMBER:** HCR1JJW

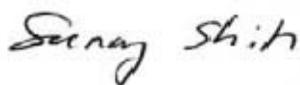
**DATE TESTED:** NOVEMBER 021-23, 2008

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:



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SUNNY SHIH  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

Tested By:



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CHIN PANG  
EMC ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 2, and RSS-210 Issue 7 Annex 8.

## 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. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Power Line Conducted Emission	+/- 2.3 dB
Radiated Emission	+/- 3.4 dB

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is an 802.11bg, BT, WWAN Combo Module

The radio module is manufactured by Qualcomm Corporation.

### 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	17.33	54.08
2412 - 2462	802.11g	22.89	194.54

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a dipole antenna, with a maximum gain of 2.0 dBi.

### 5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host support equipment during testing was Qualcomm Test Manager, rev.2.4

The test utility software used during testing was QTM rev. 2.4

### 5.5. WORST-CASE CONFIGURATION AND MODE

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

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	Manufacturer	Model	Serial Number
Laptop	HP	Compaq6910p	CND8153FTV
AC Adapter	HP	PA-1131-08HC	7500329102
DC Power Supply	XANTREX	XHR60-18	1064
AC Adapter	QUALCOMM	GWC-1700	CV90-C6024
Qualcomm Miniposser Fenway	QUALCOMM	NA	NA

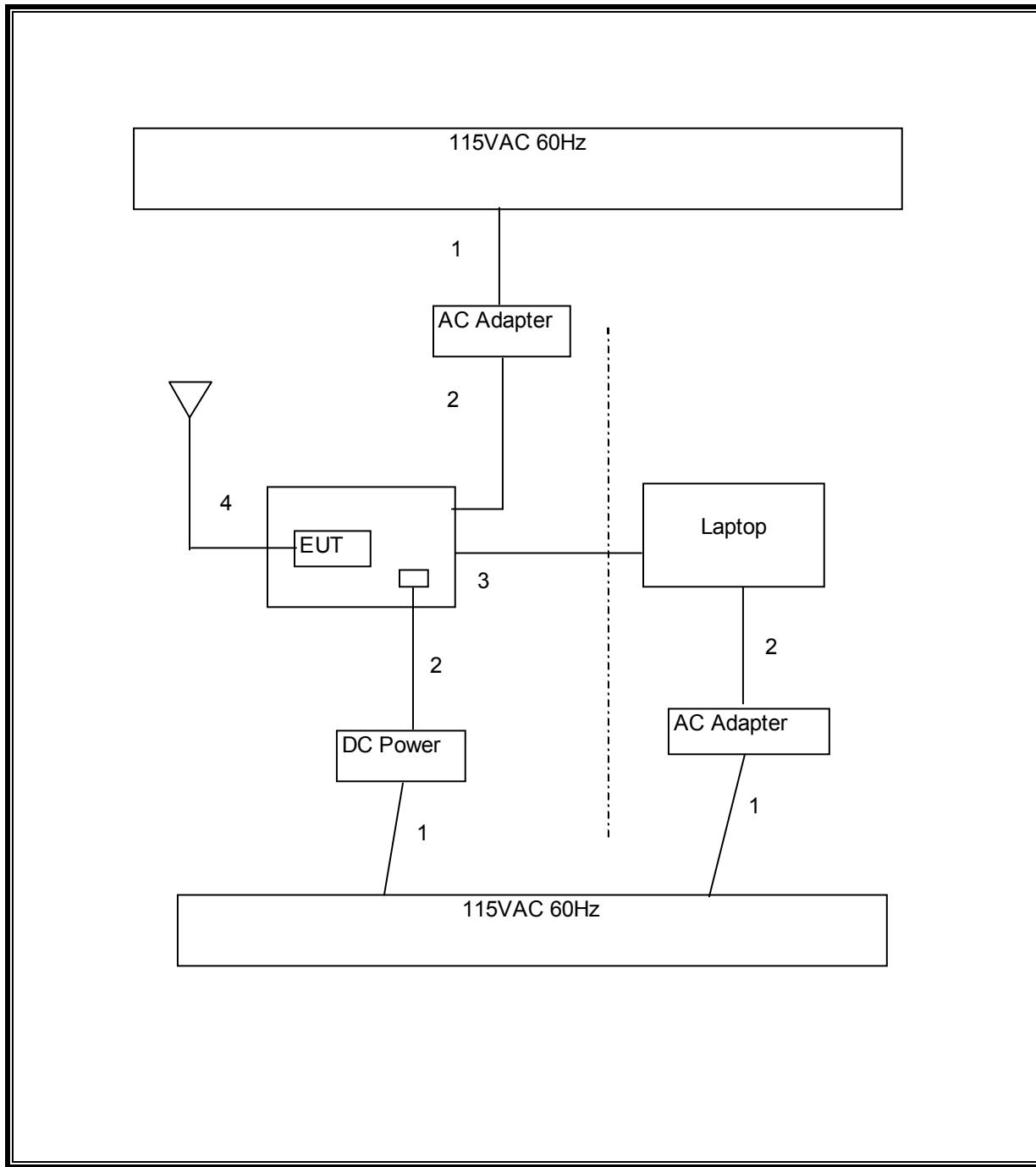
### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identic Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	3	US 115V	Un-shielded	2m	NA
2	DC	3	DC	Un-shielded	2m	NA
3	USB	1	USB	Un-shielded	2m	NA
4	Antenna	1	Dipole	Un-shielded	None	NA

### TEST SETUP

The EUT is installed in a Test Fixture and connected to a Laptop via a USB cable 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 Date	Cal Due
Antenna, Horn, 18 GHz	EMCO	3115	C00945	04/22/08	04/22/09
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	09/27/08	11/27/08
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	03/31/08	03/31/09
Antenna, BiLog, 2 GHz	Sunol Sciences	JB1	C01016	02/11/08	02/11/09
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	04/08/08	10/08/09
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4407B	C01101	10/22/07	01/22/09
Peak Power Meter	Agilent / HP	E4416A	C00963	12/04/07	12/04/09
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/07/07	12/07/09
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRC13192	N02683	CNR	CNR

## 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.

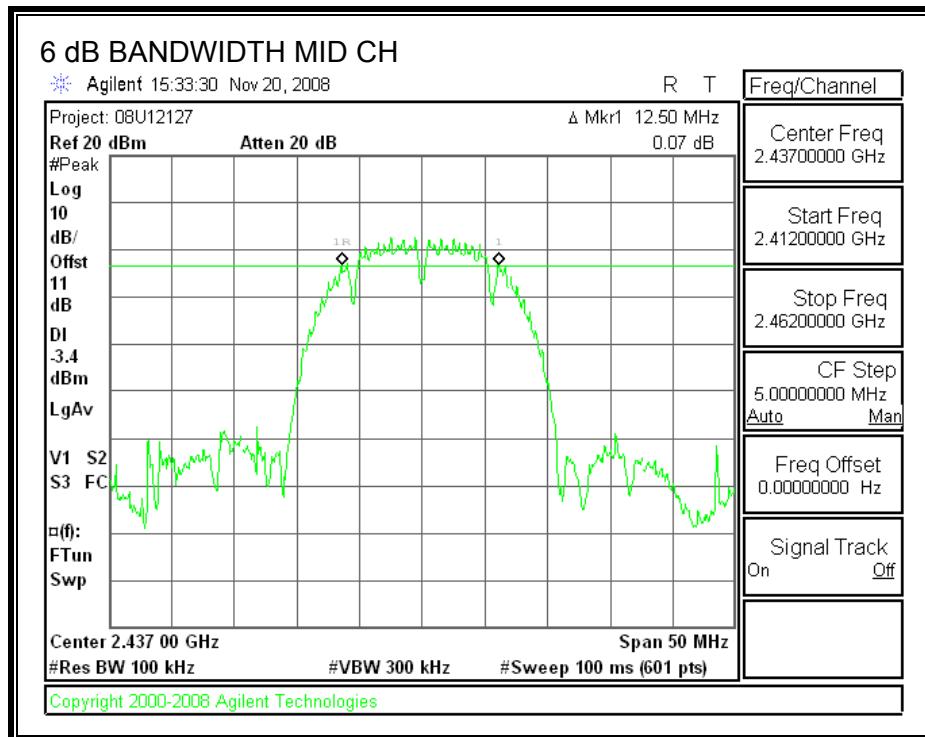
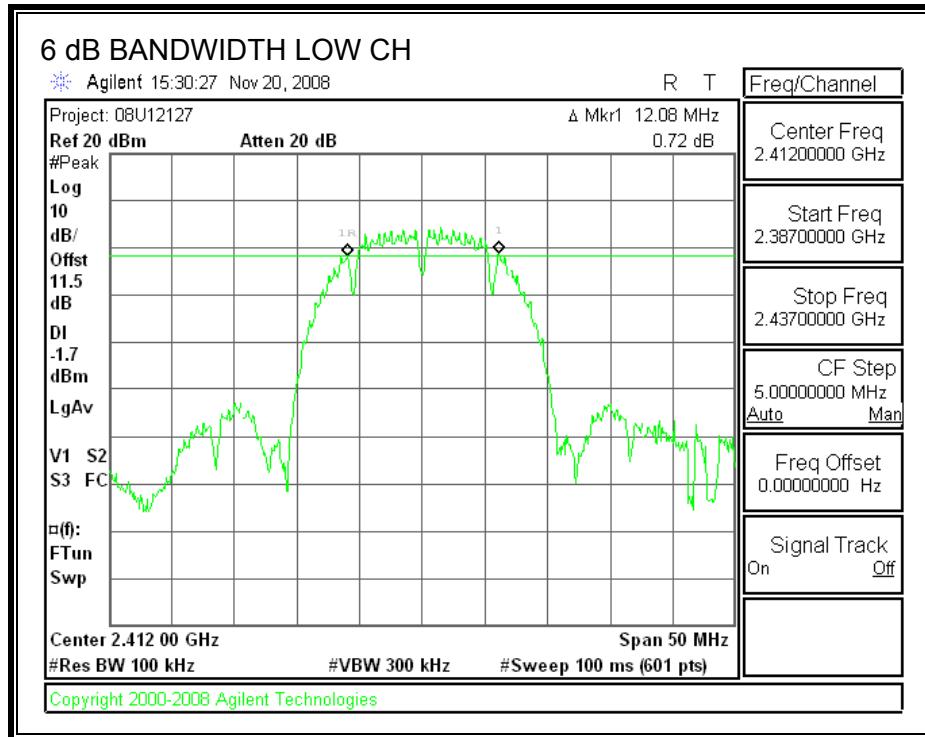
##### TEST PROCEDURE

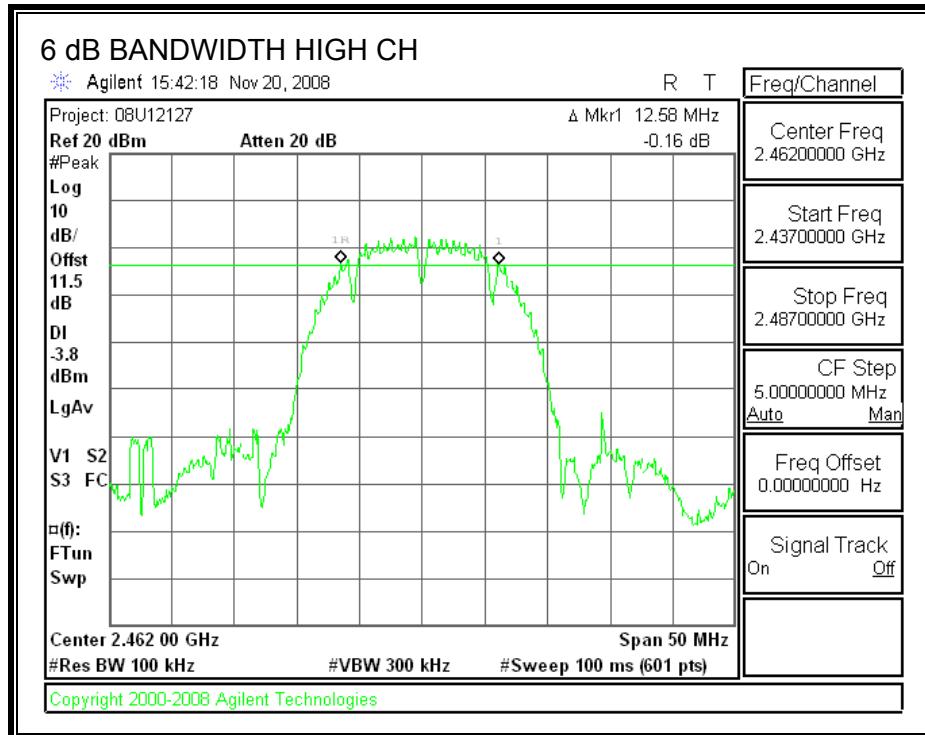
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

##### RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
1	2412	12.08	0.5
6	2437	12.50	0.5
11	2462	12.58	0.5

## 6 dB BANDWIDTH





### 7.1.2. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

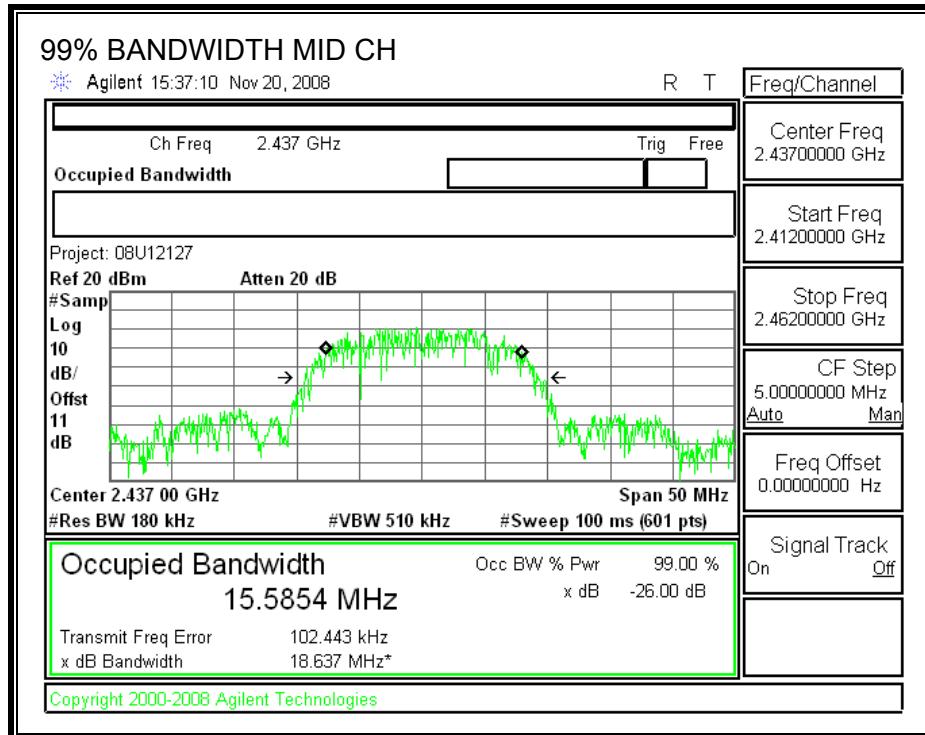
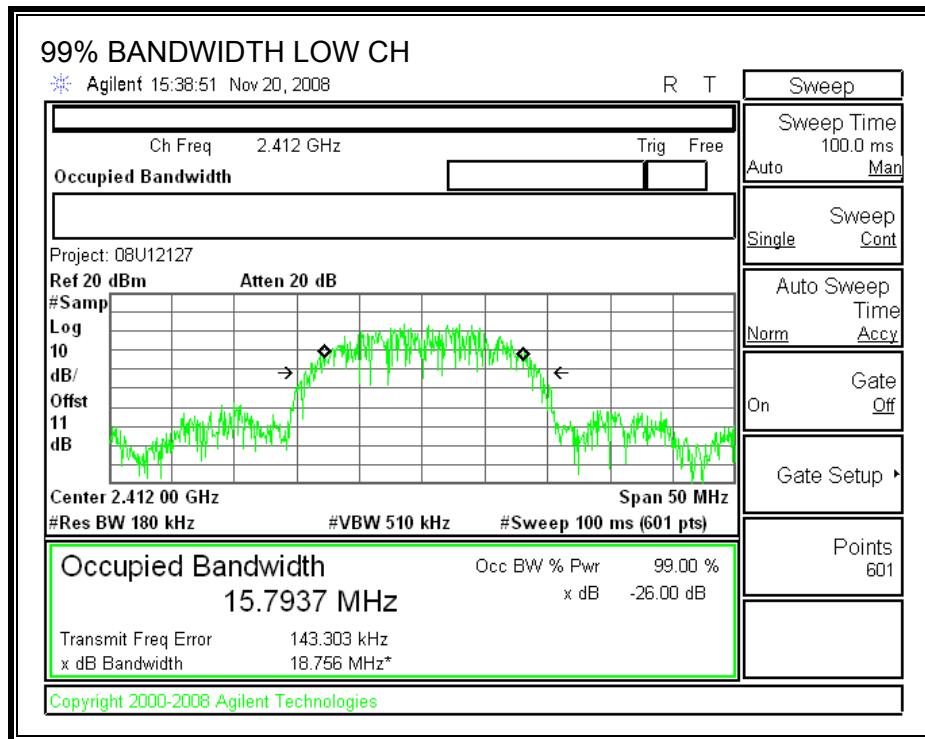
#### TEST PROCEDURE

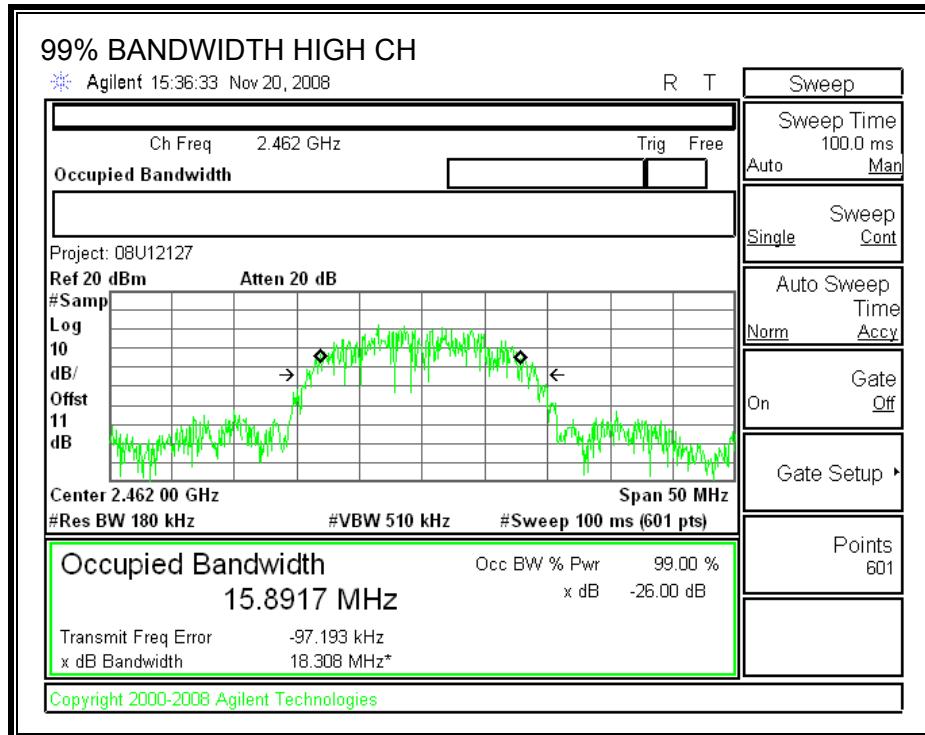
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

#### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
1	2412	15.7937
6	2437	15.5854
11	2462	15.8917

**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.

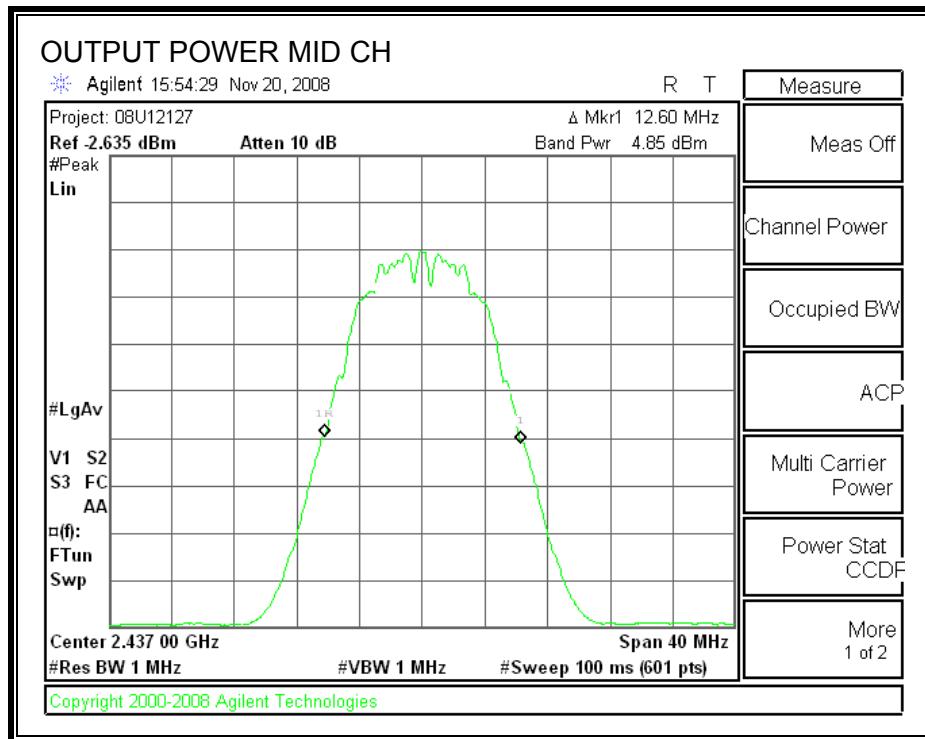
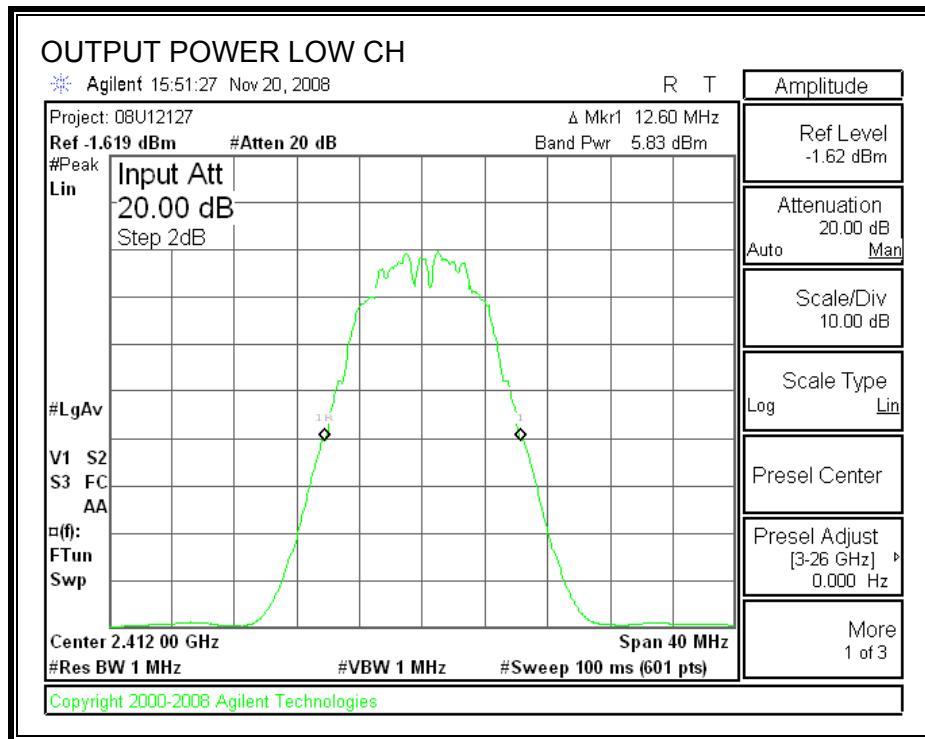
#### TEST PROCEDURE

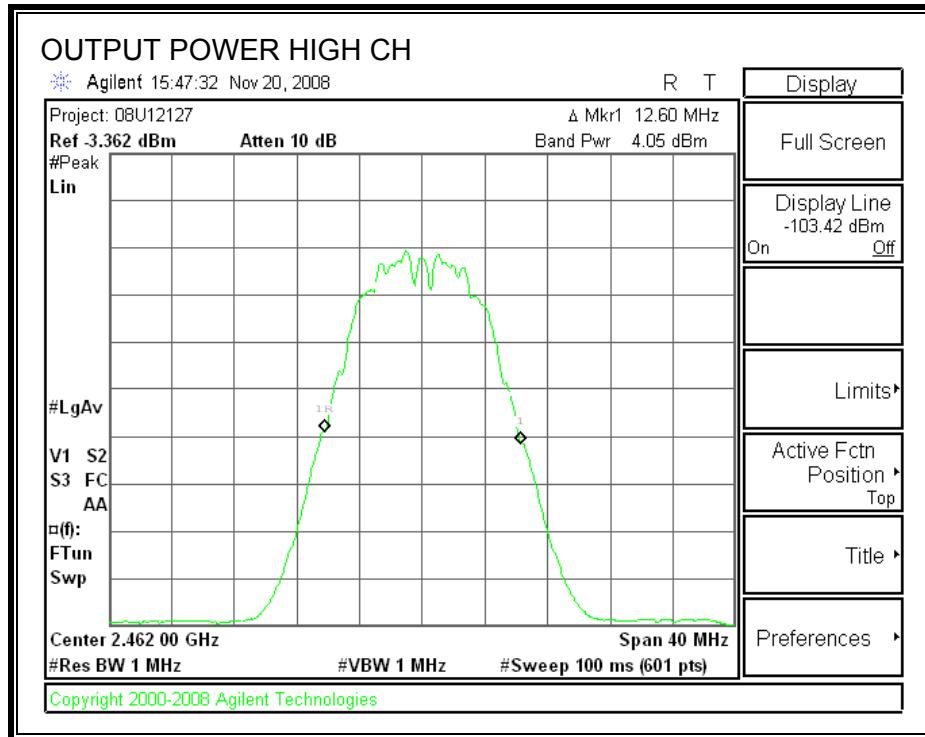
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

#### RESULTS

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
1	2412	5.83	11.5	17.33	30	-12.67
6	2437	4.85	11.5	16.35	30	-13.65
11	2462	4.05	11.5	15.55	30	-14.45

## OUTPUT POWER





### 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 11.5 dB (including 10 dB pad and 1.5dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
1	2412	15.40
6	2437	14.30
11	2462	13.20

### 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.

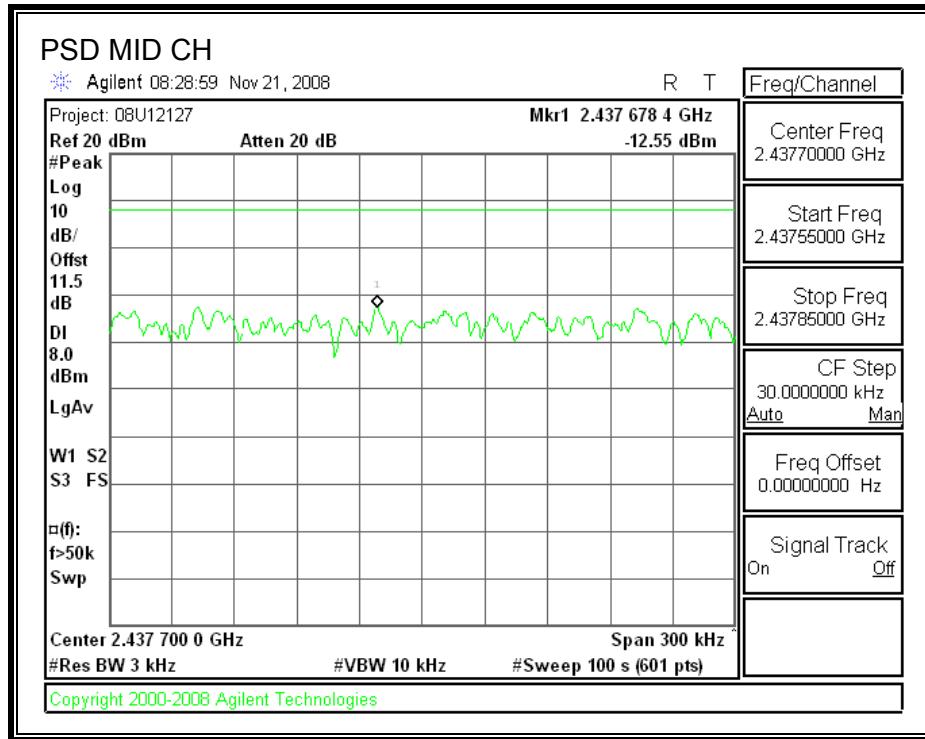
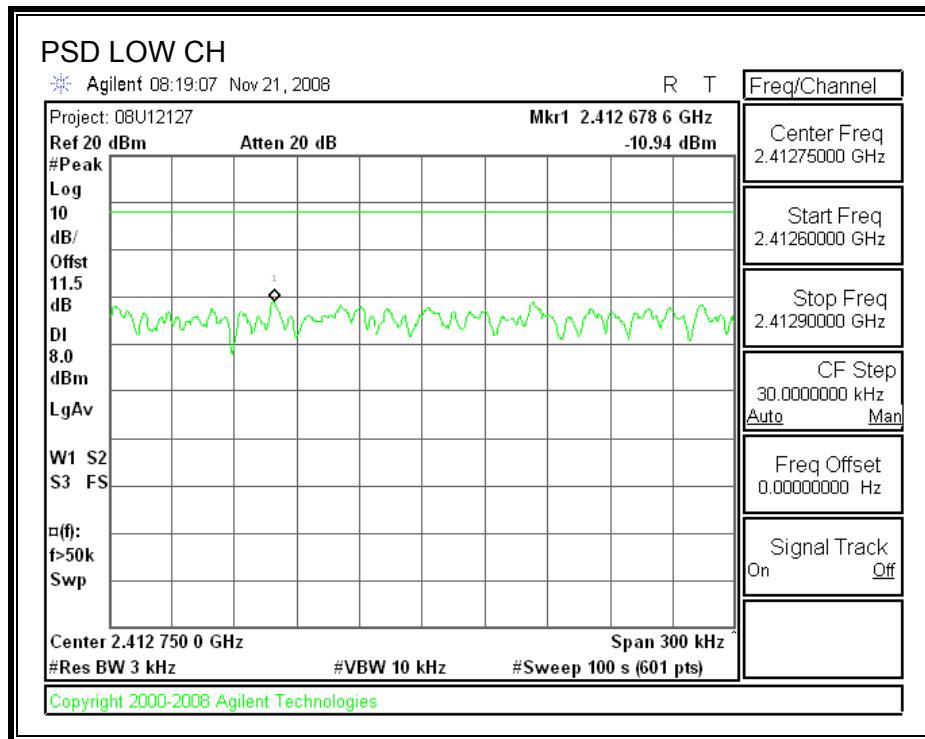
#### TEST PROCEDURE

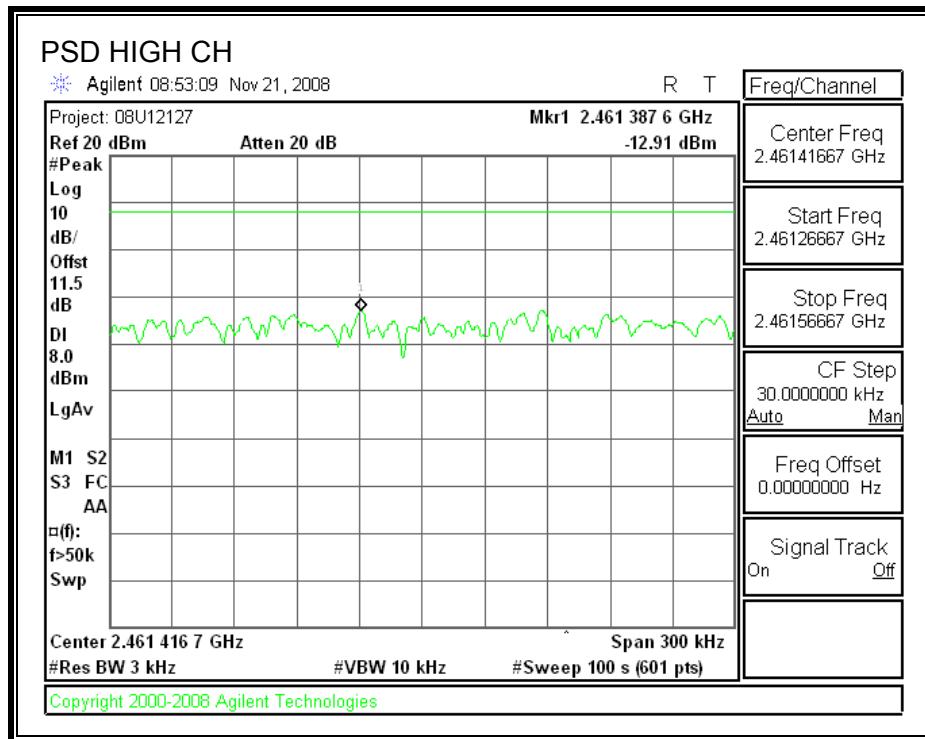
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

#### RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
1	2412	-10.94	8	-18.94
6	2437	-12.55	8	-20.55
11	2462	-12.91	8	-20.91

## 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.

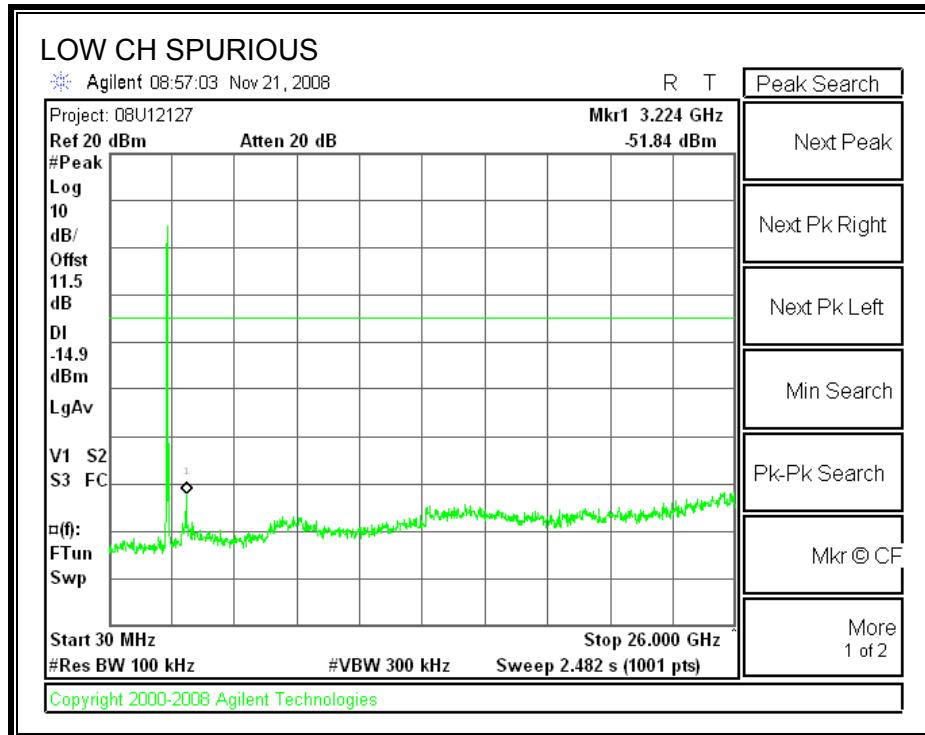
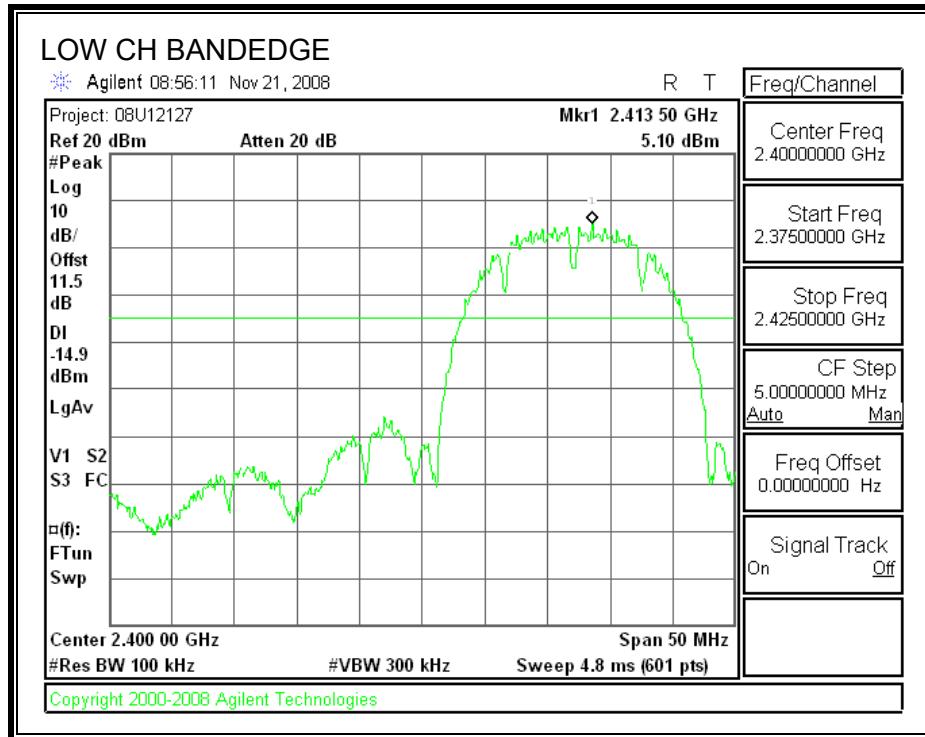
#### TEST PROCEDURE

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.

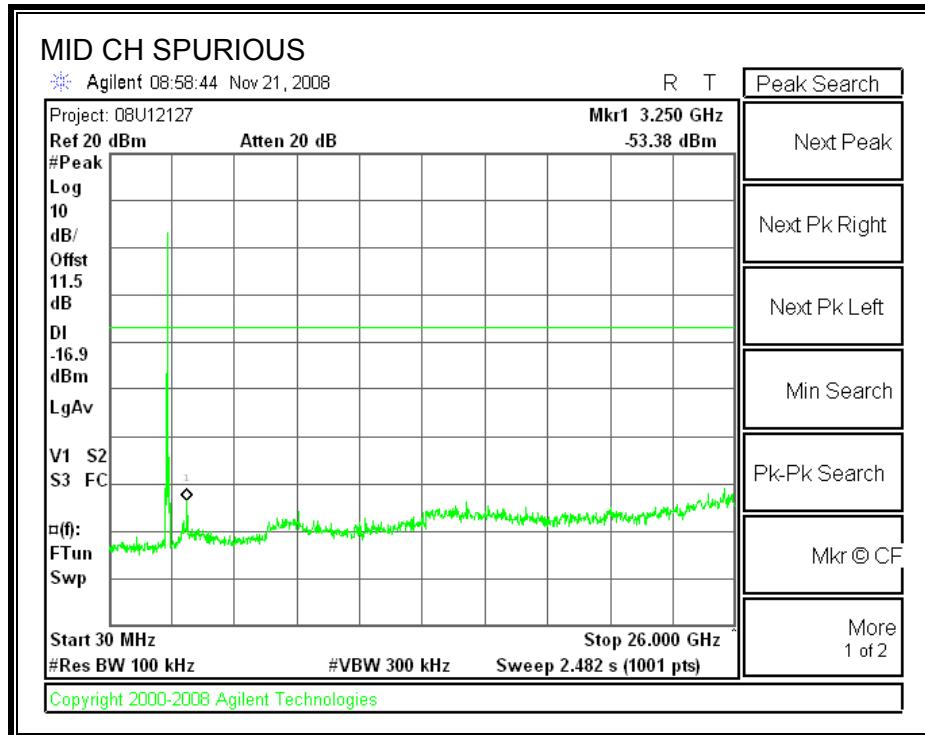
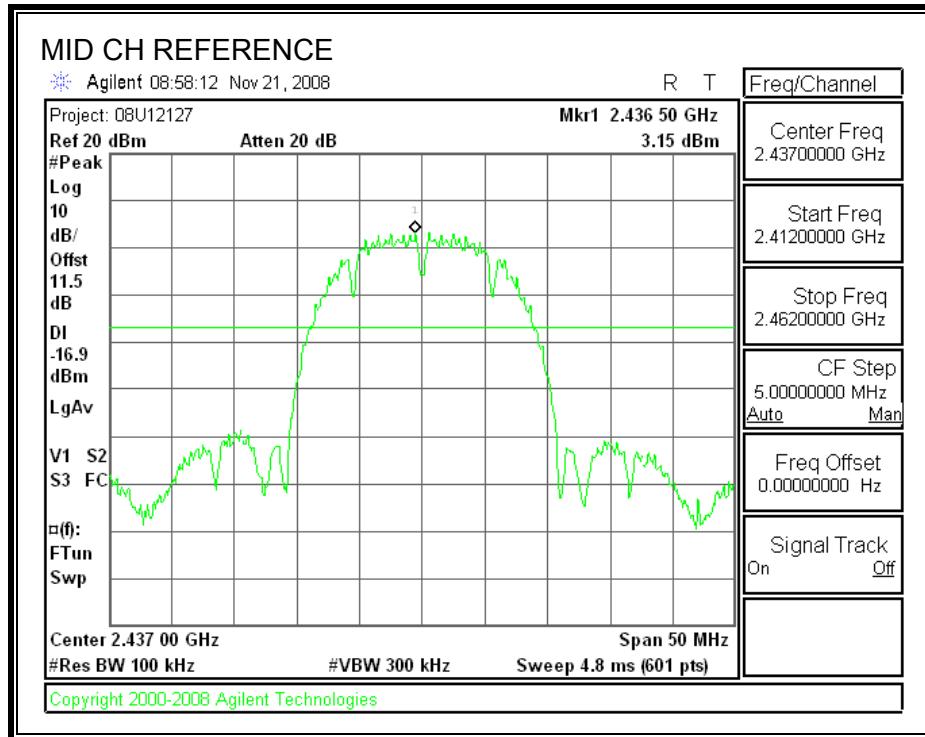
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

#### RESULTS

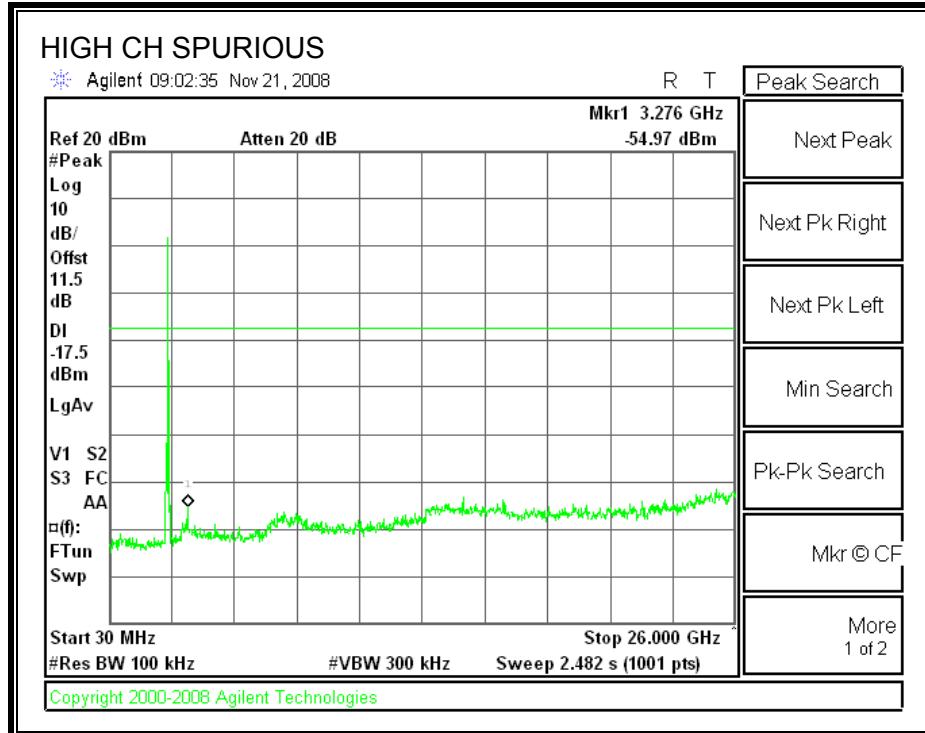
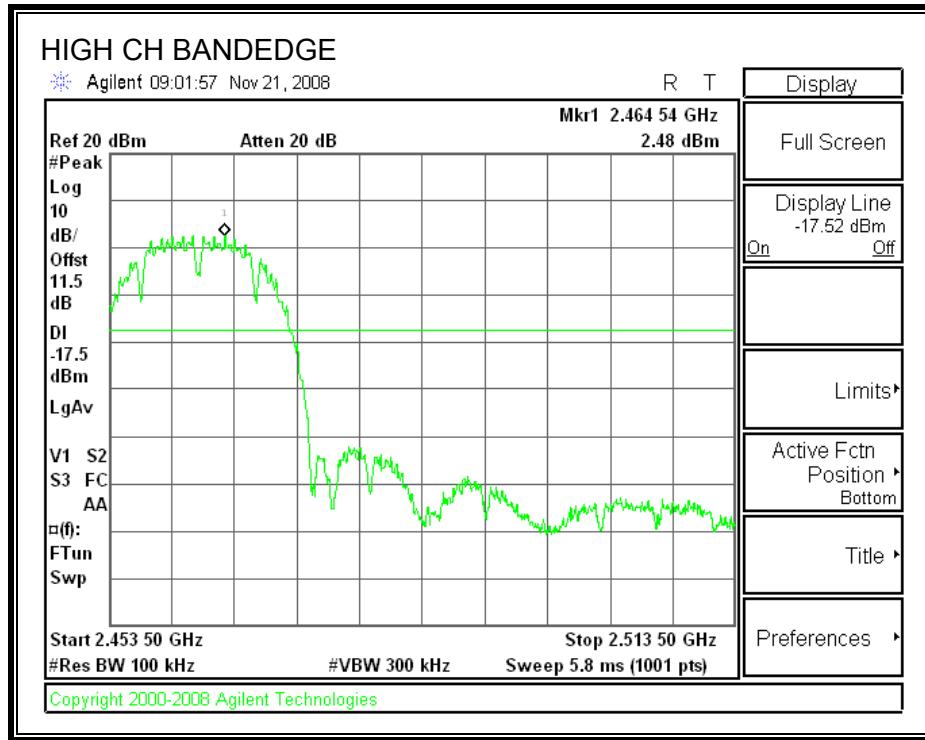
SPURIOUS EMISSIONS, LOW CHANNEL



**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.

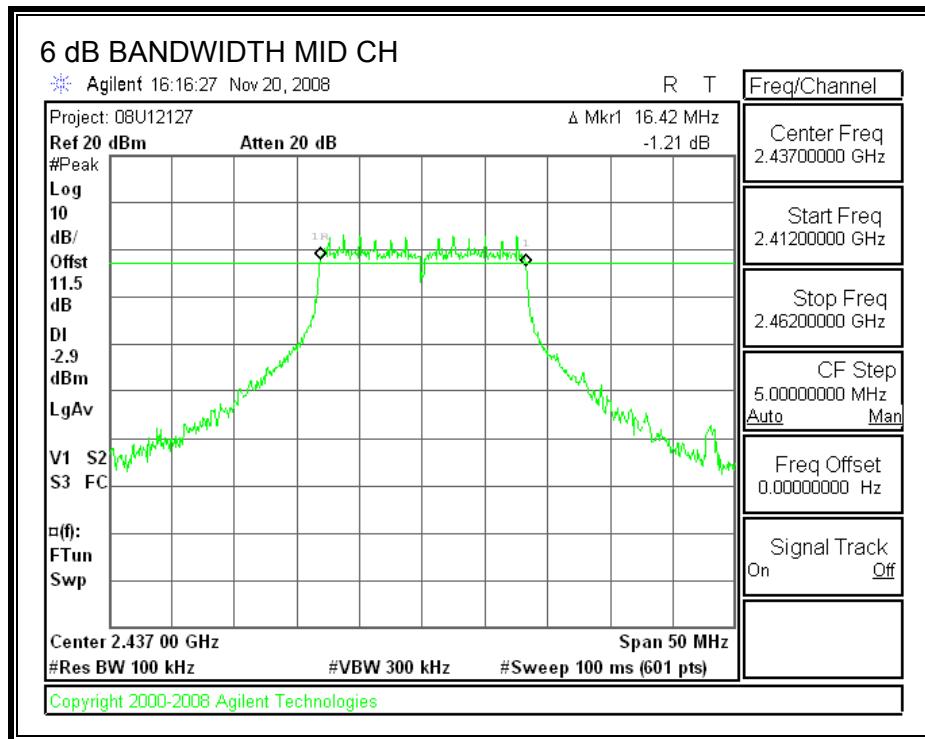
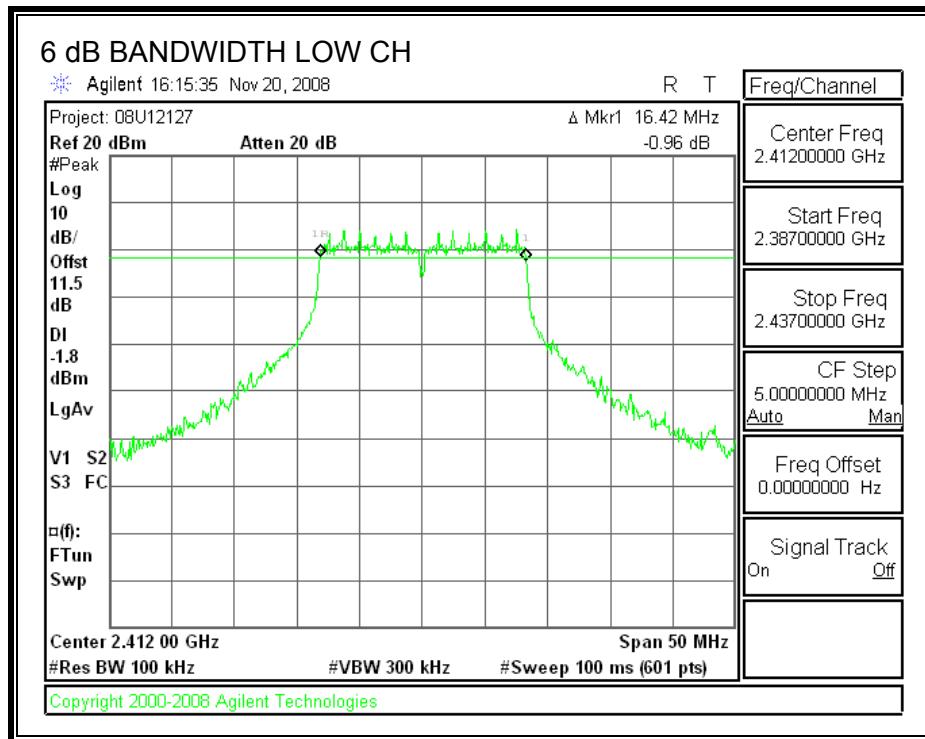
#### TEST PROCEDURE

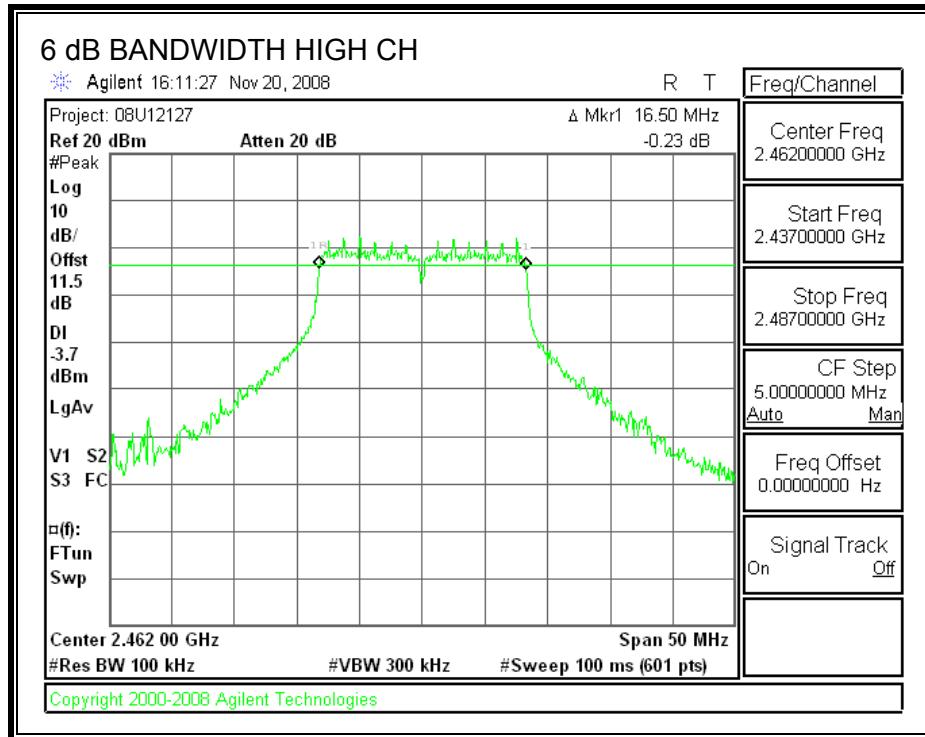
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

#### RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
1	2412	16.42	0.5
6	2437	16.42	0.5
11	2462	16.50	0.5

## 6 dB BANDWIDTH





### 7.2.2. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

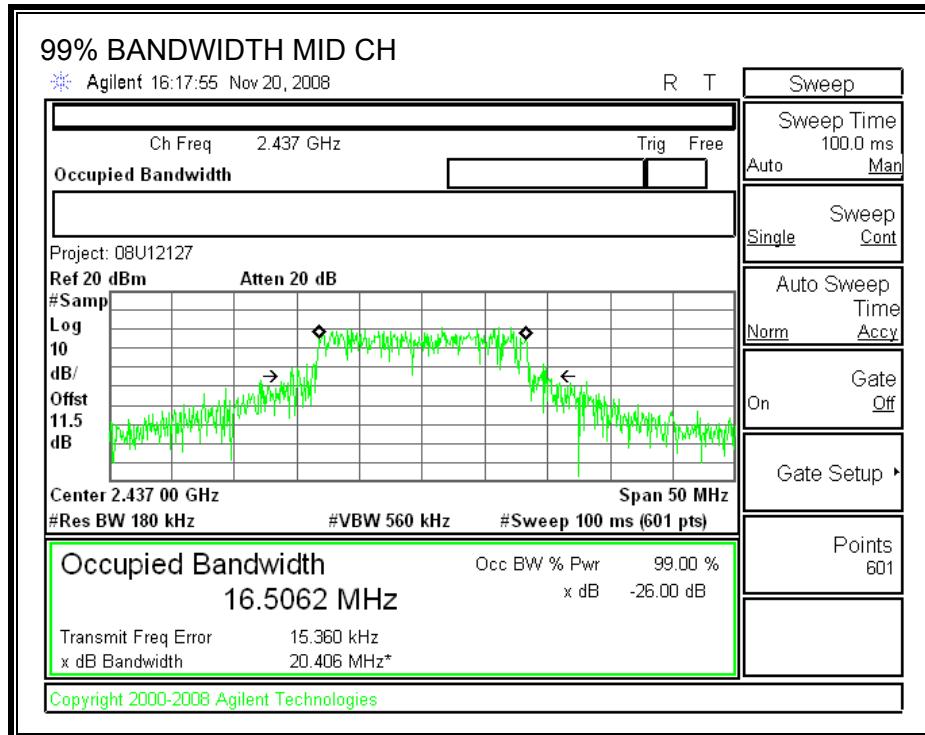
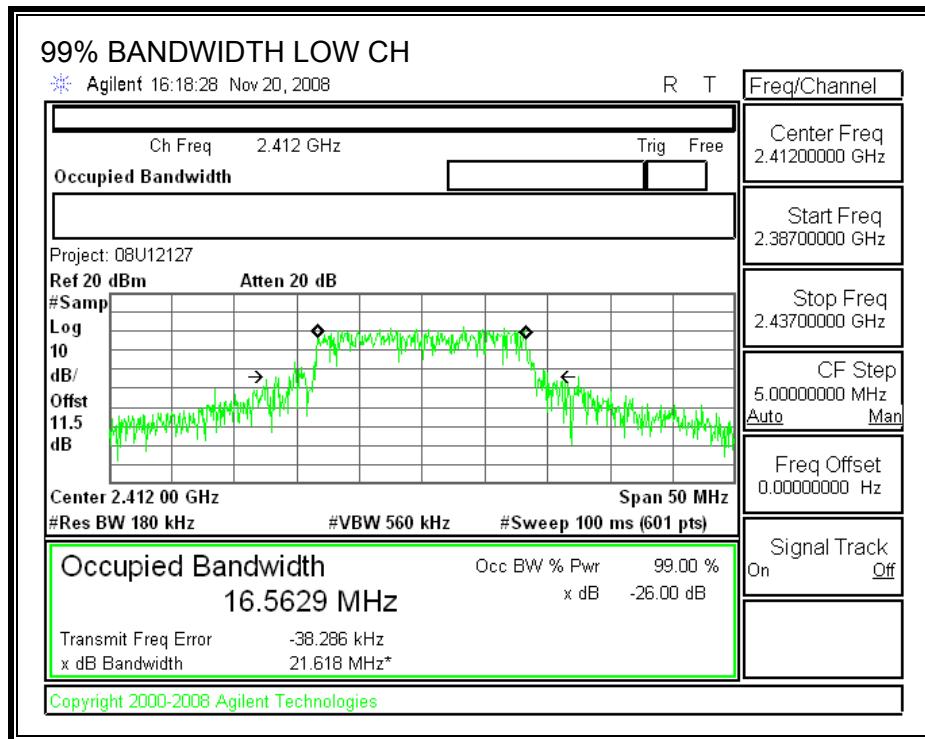
#### TEST PROCEDURE

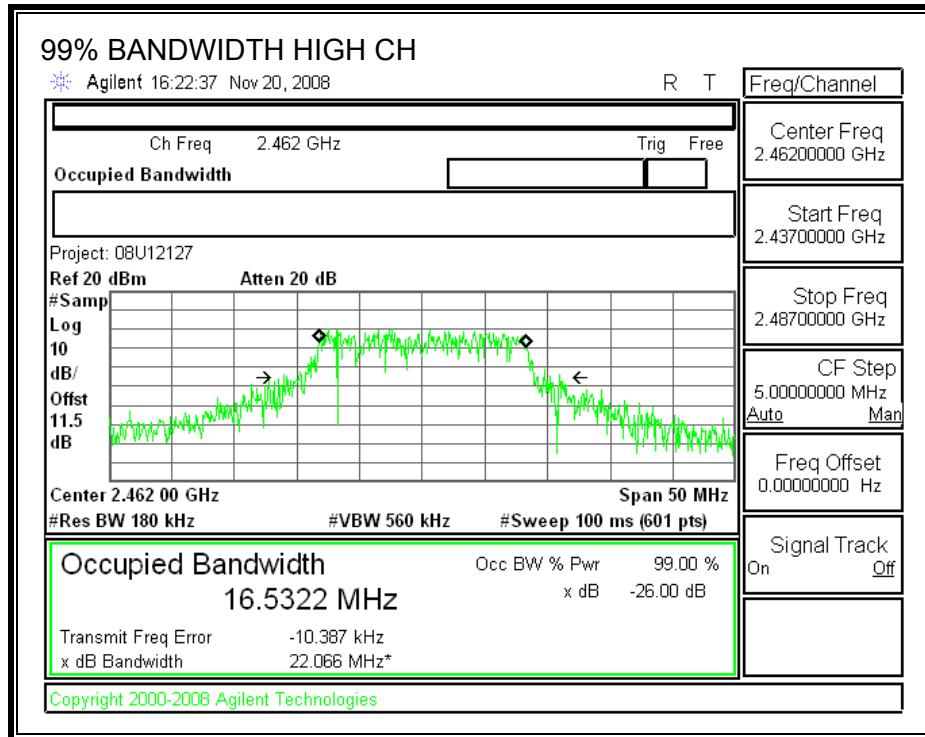
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

#### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
1	2412	16.5629
6	2437	16.5062
11	2462	16.5322

**99% BANDWIDTH**





### 7.2.3. 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.

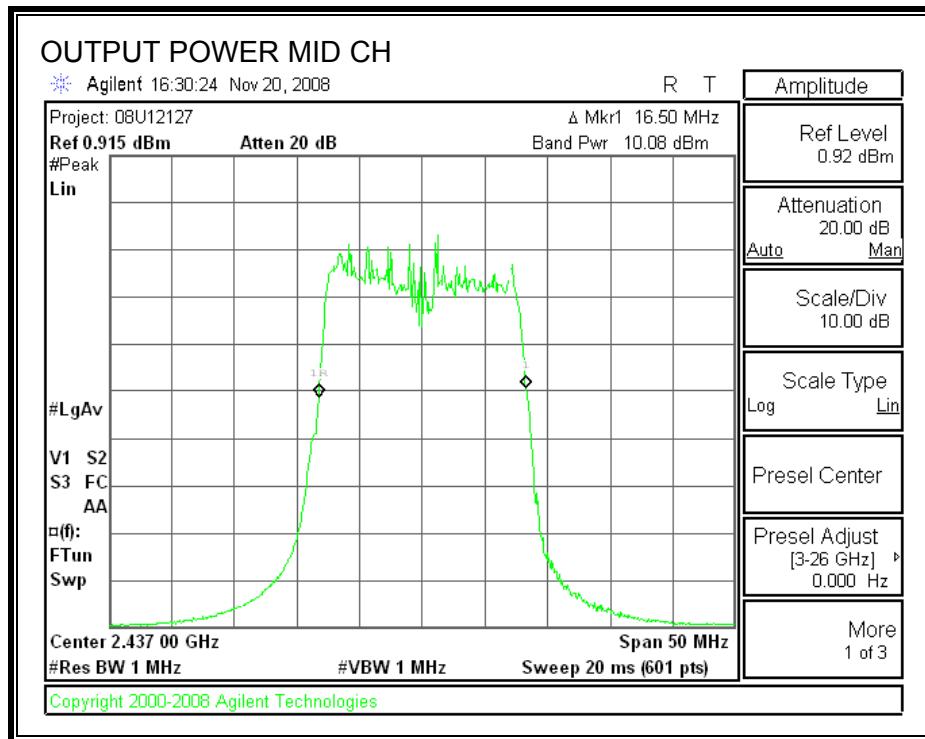
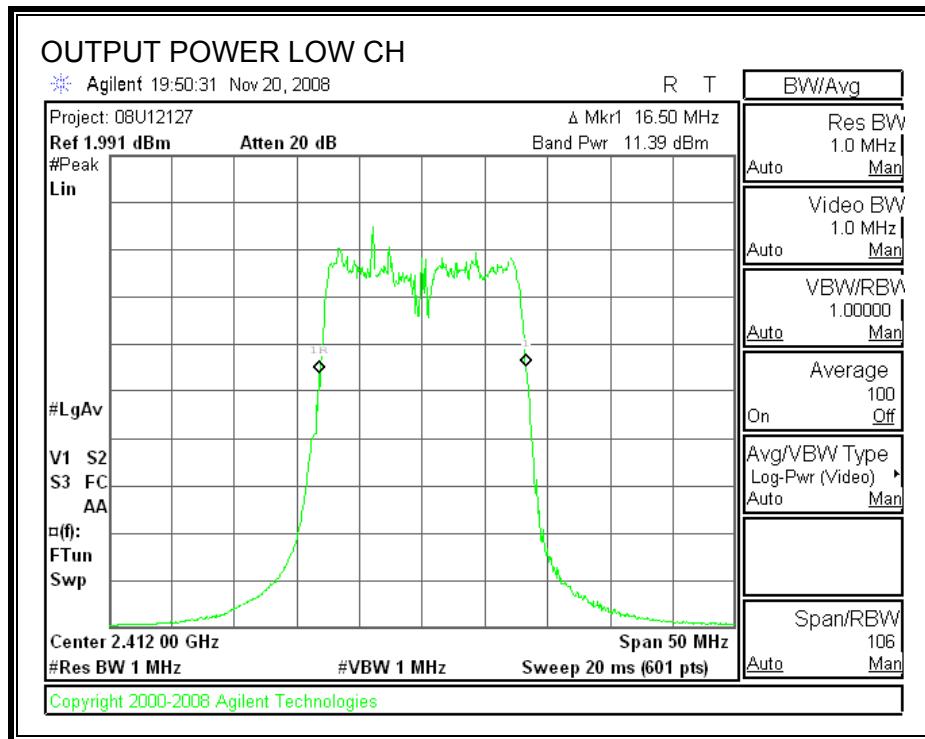
#### TEST PROCEDURE

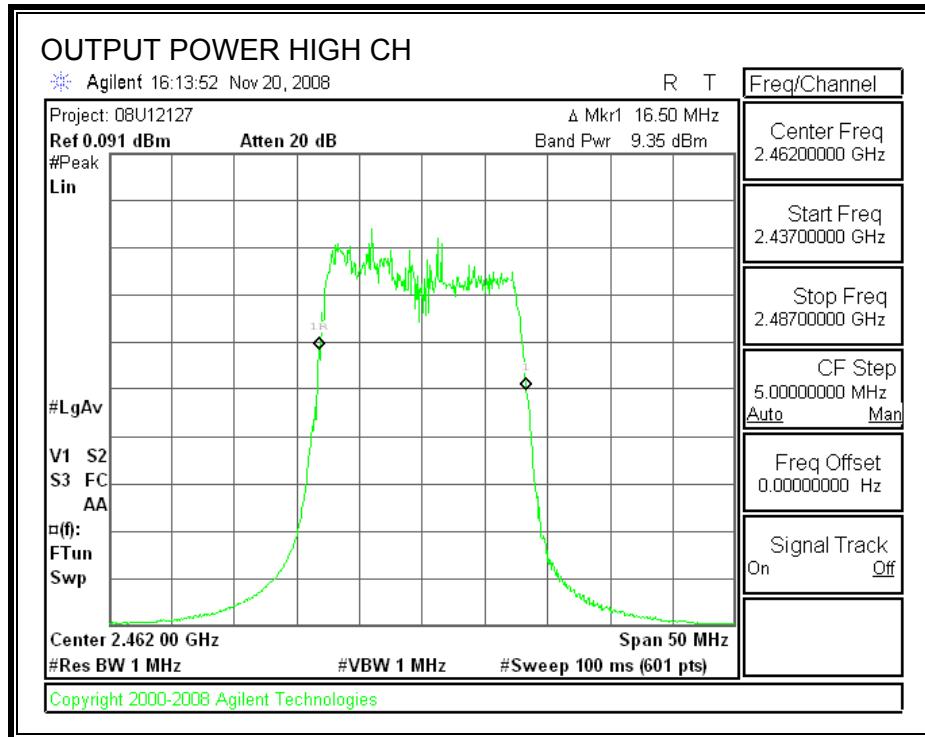
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

#### RESULTS

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
1	2412	11.39	11.5	22.89	30	-7.11
6	2437	10.08	11.5	21.58	30	-8.42
11	2462	9.35	11.5	20.85	30	-9.15

## OUTPUT POWER





### 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 11.5dB (including 10 dB pad and 1.5dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
1	2412	15.60
6	2437	14.50
11	2462	13.30

### 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.

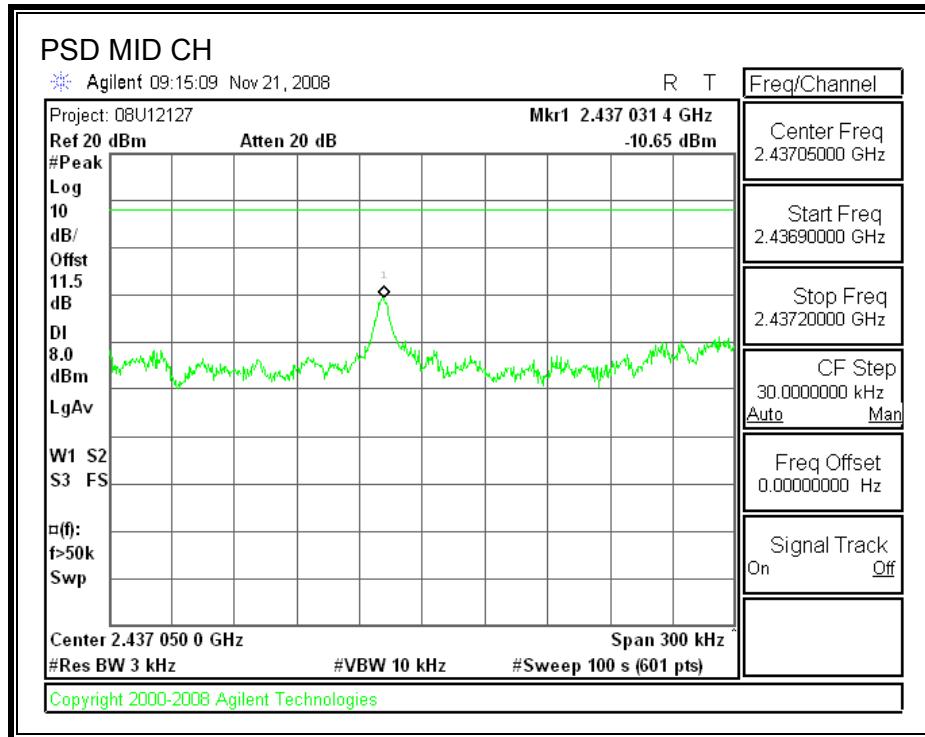
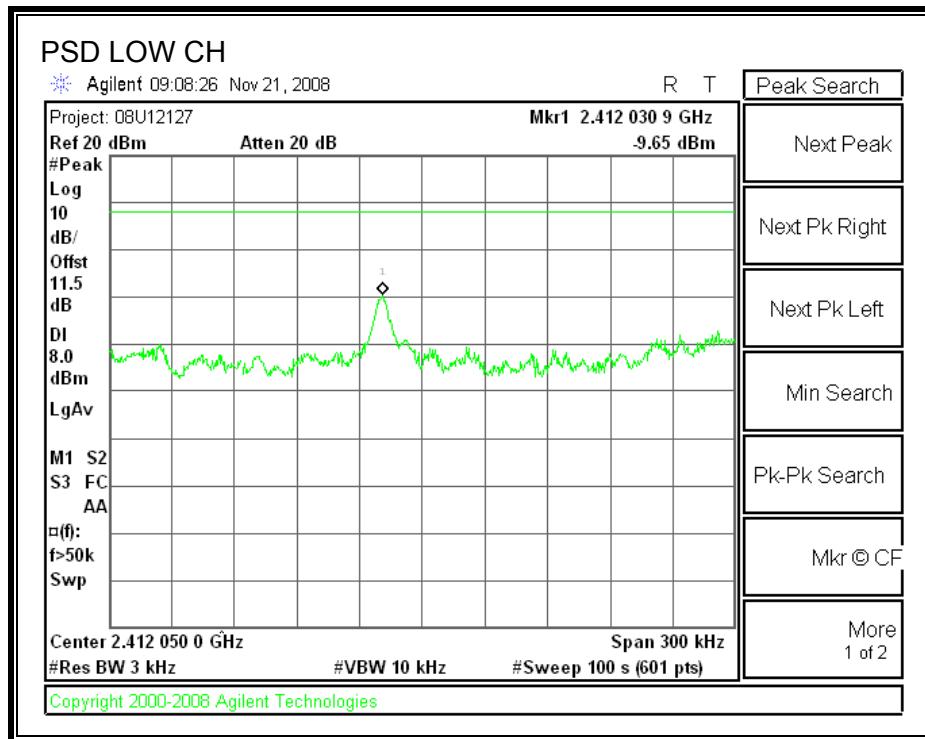
#### TEST PROCEDURE

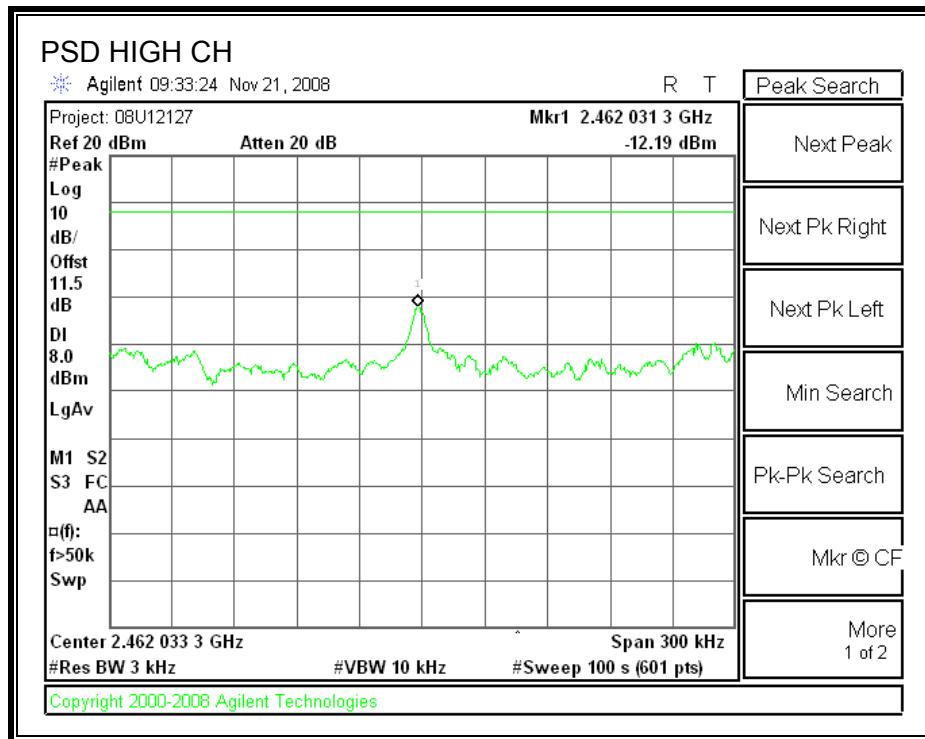
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

#### RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
1	2412	-9.65	8	-17.65
6	2437	-10.65	8	-18.65
11	2462	-12.19	8	-20.19

## 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.

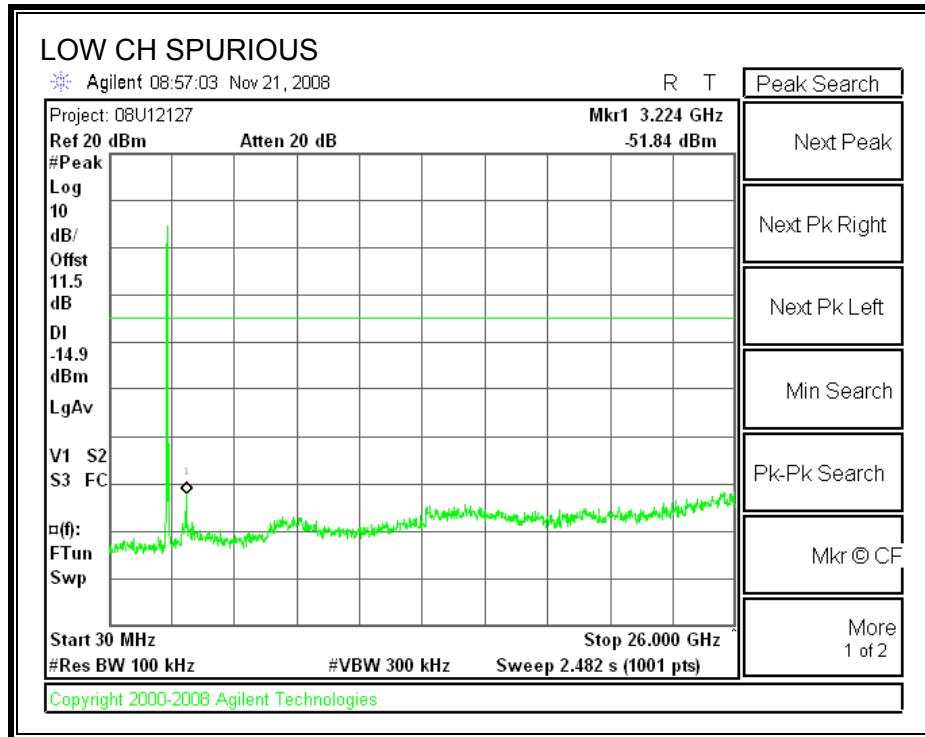
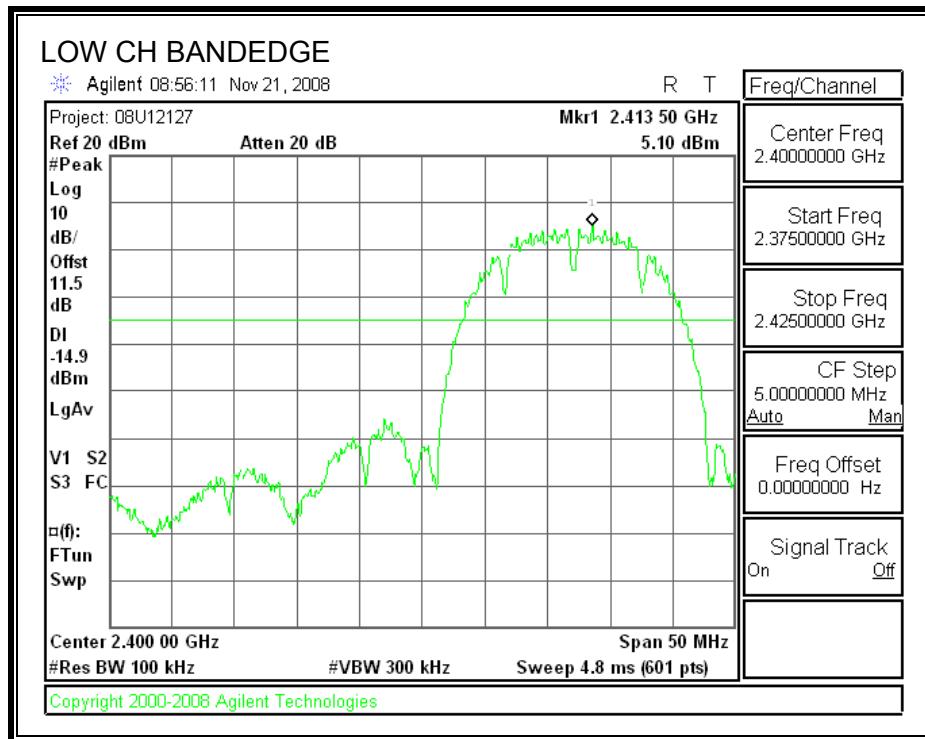
### TEST PROCEDURE

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.

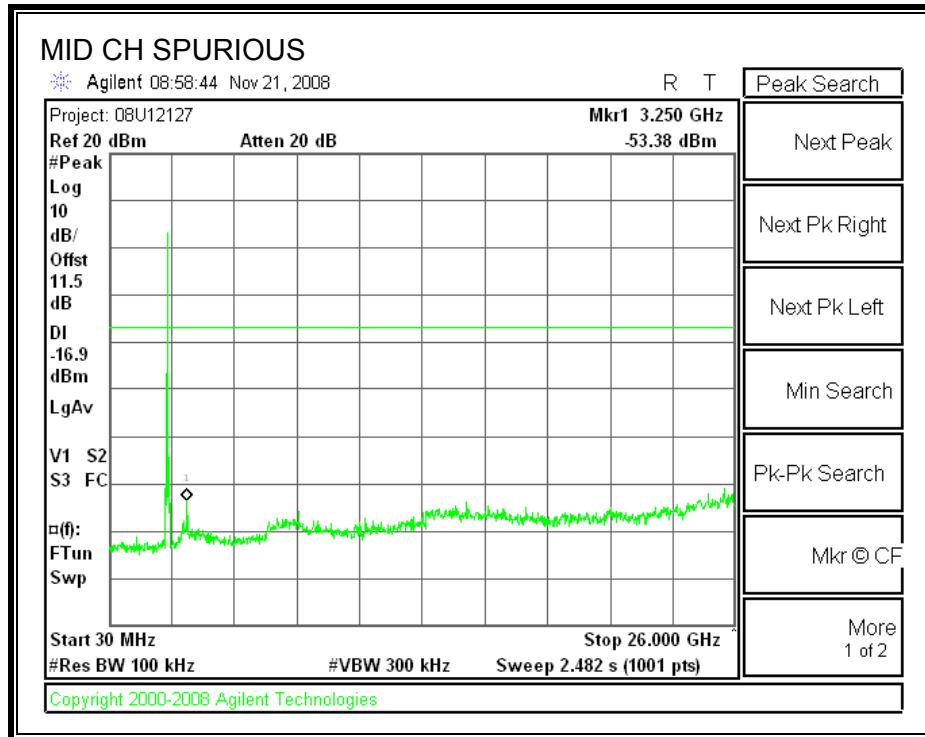
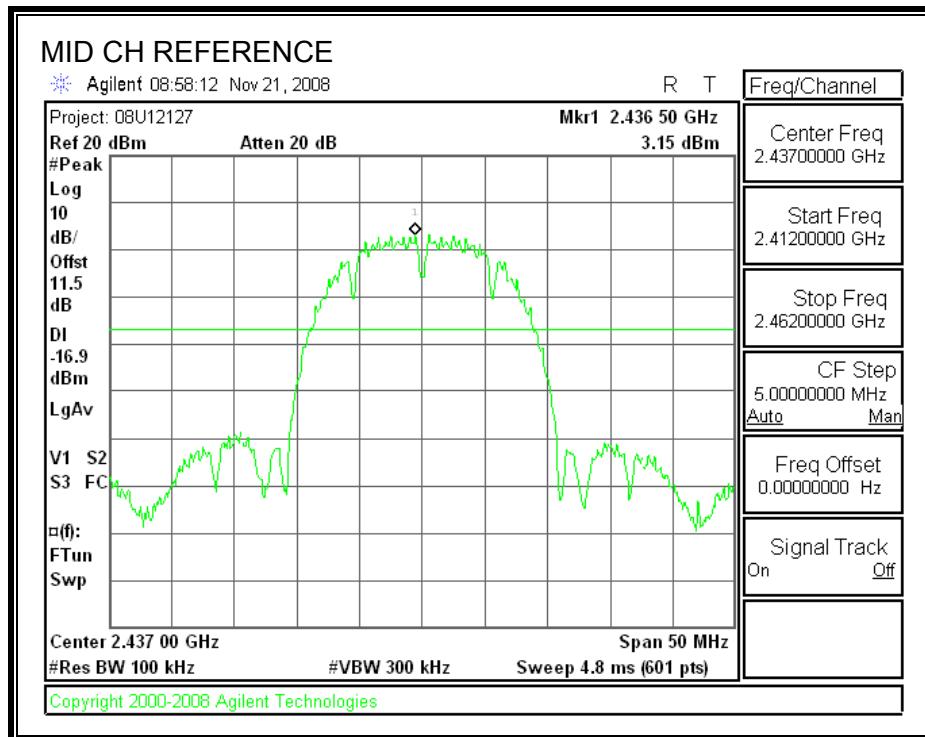
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

### RESULTS

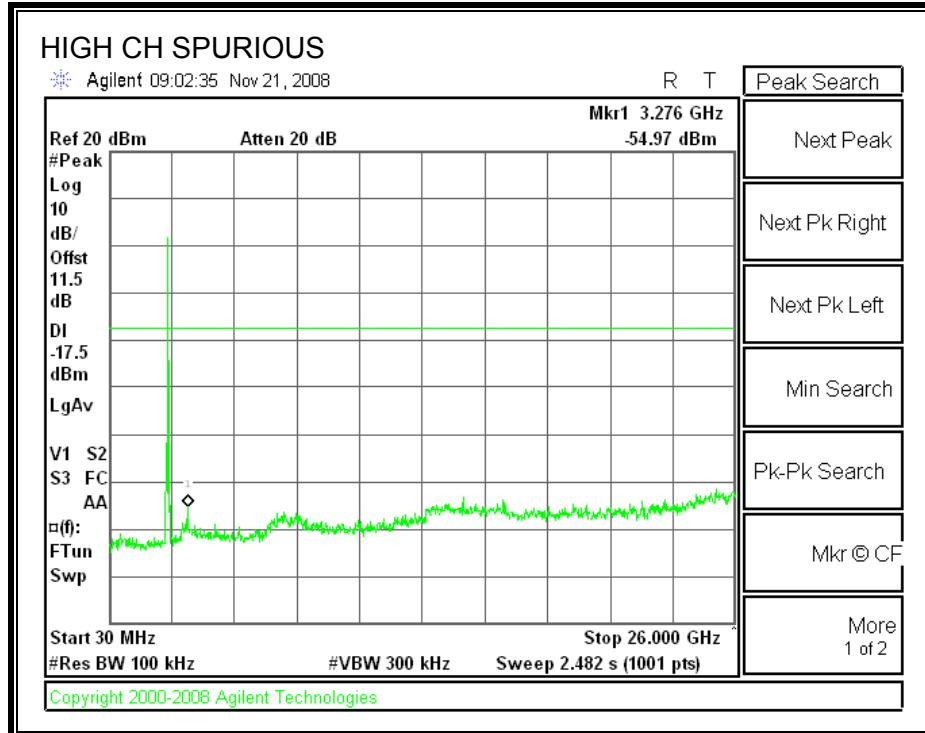
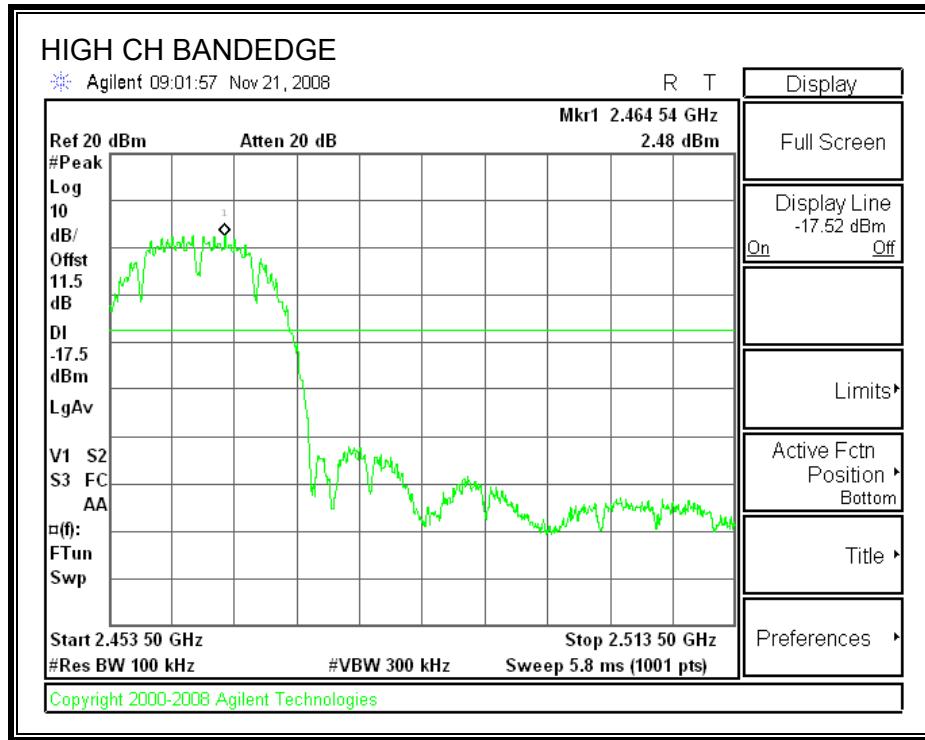
SPURIOUS EMISSIONS, LOW CHANNEL



**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.

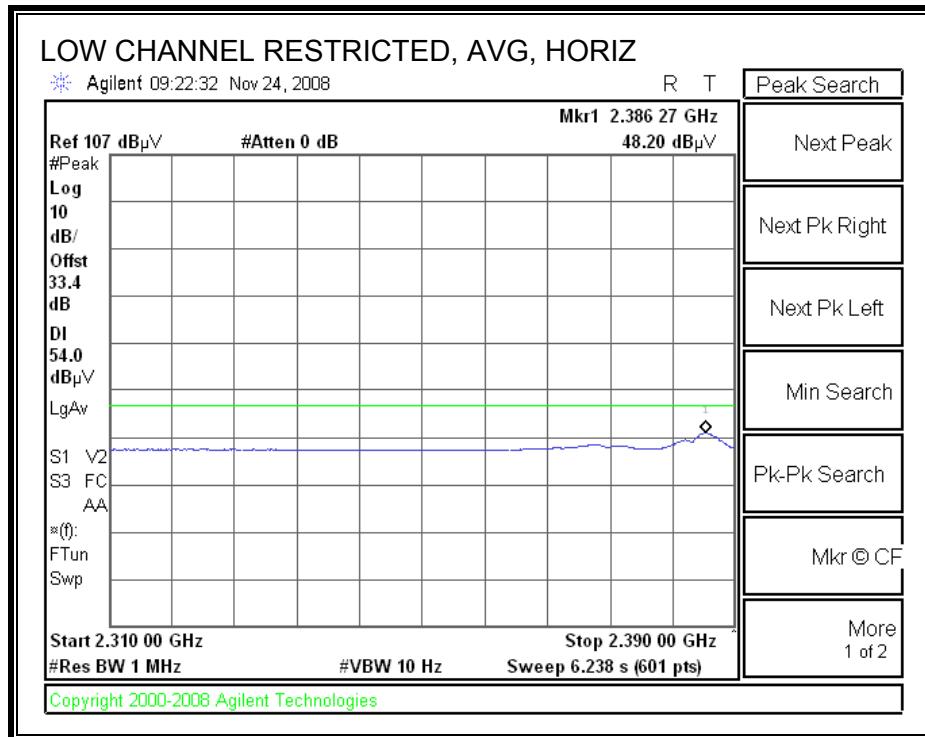
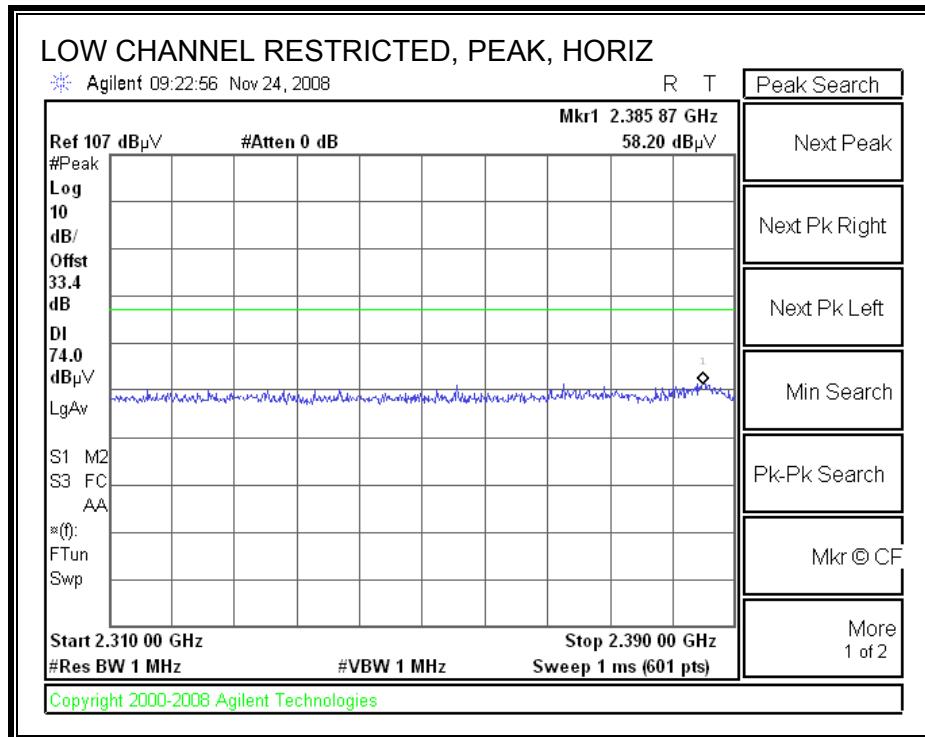
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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.

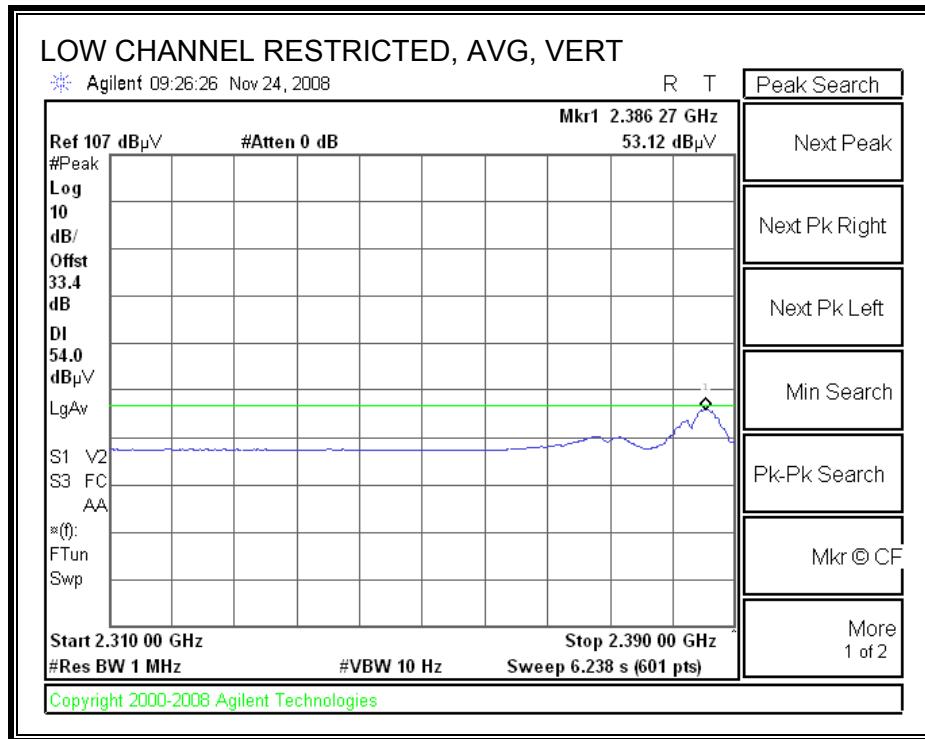
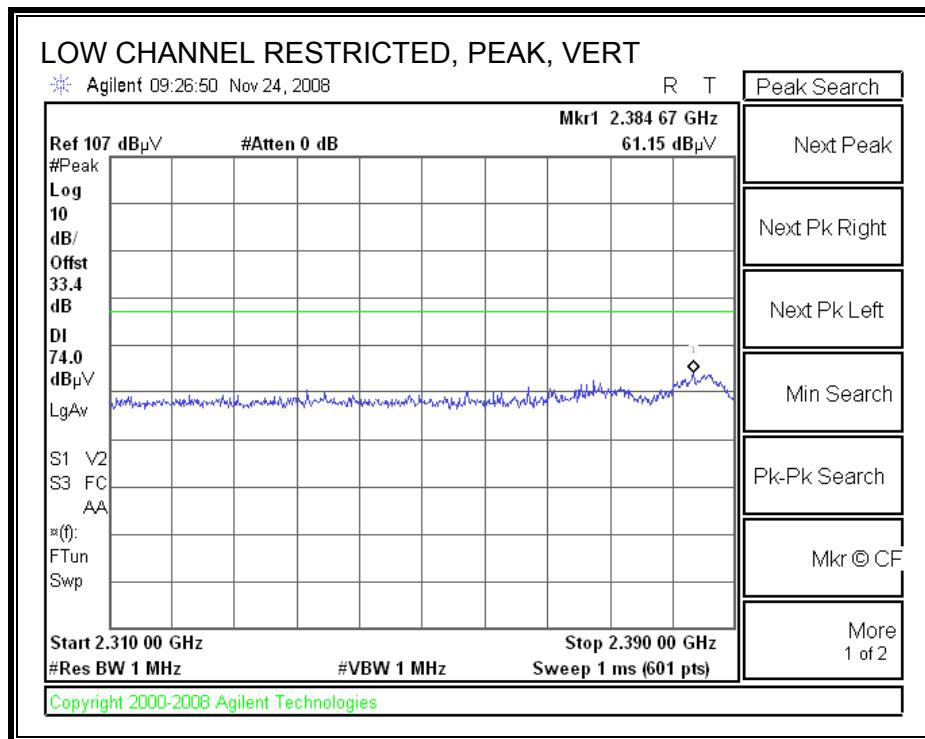
## 8.2. TRANSMITTER ABOVE 1 GHz

### 8.2.1. TRANSMITTER ABOVE 1 GHz FOR 802.11b

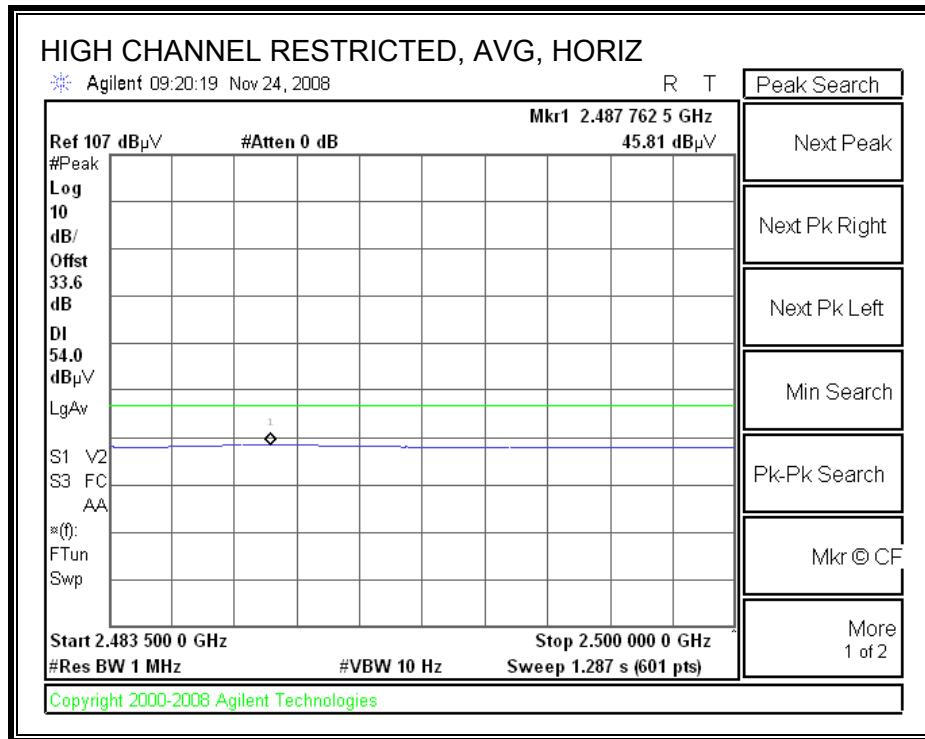
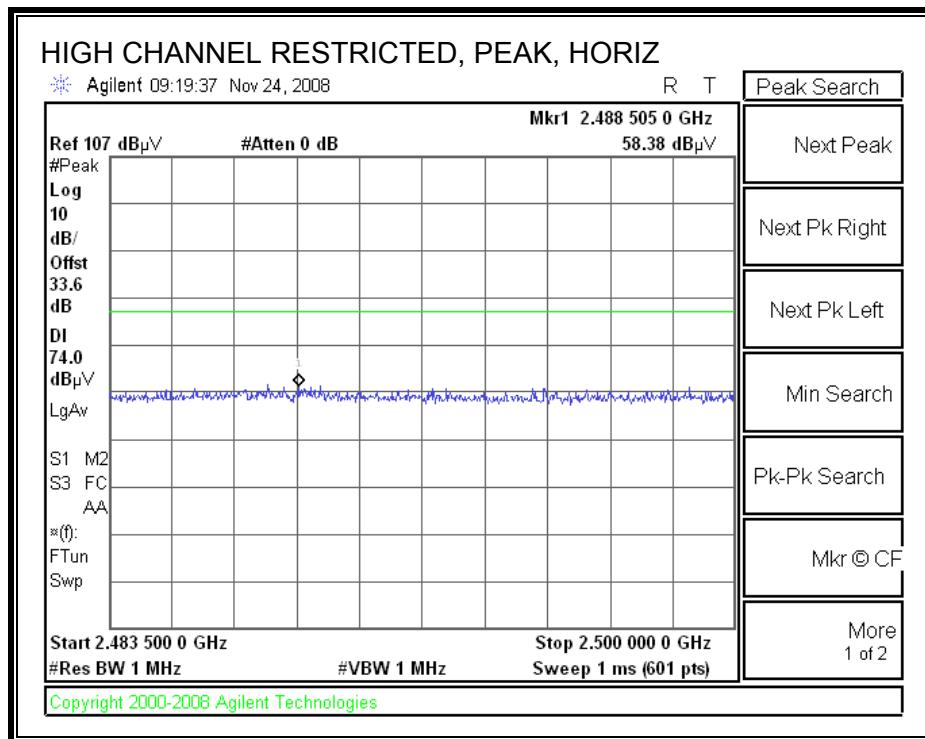
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



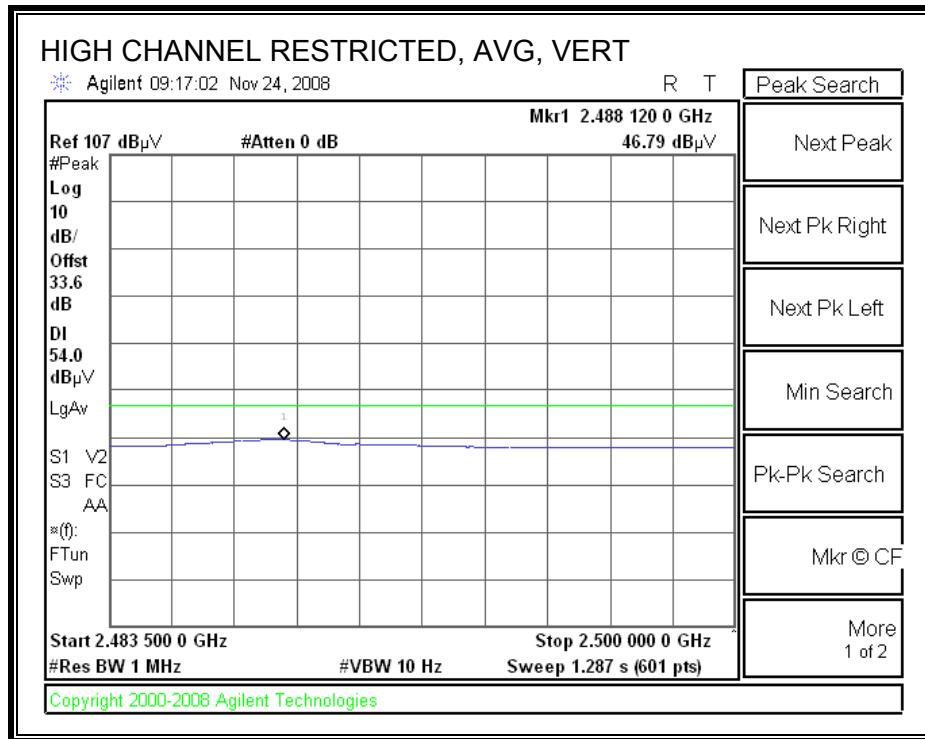
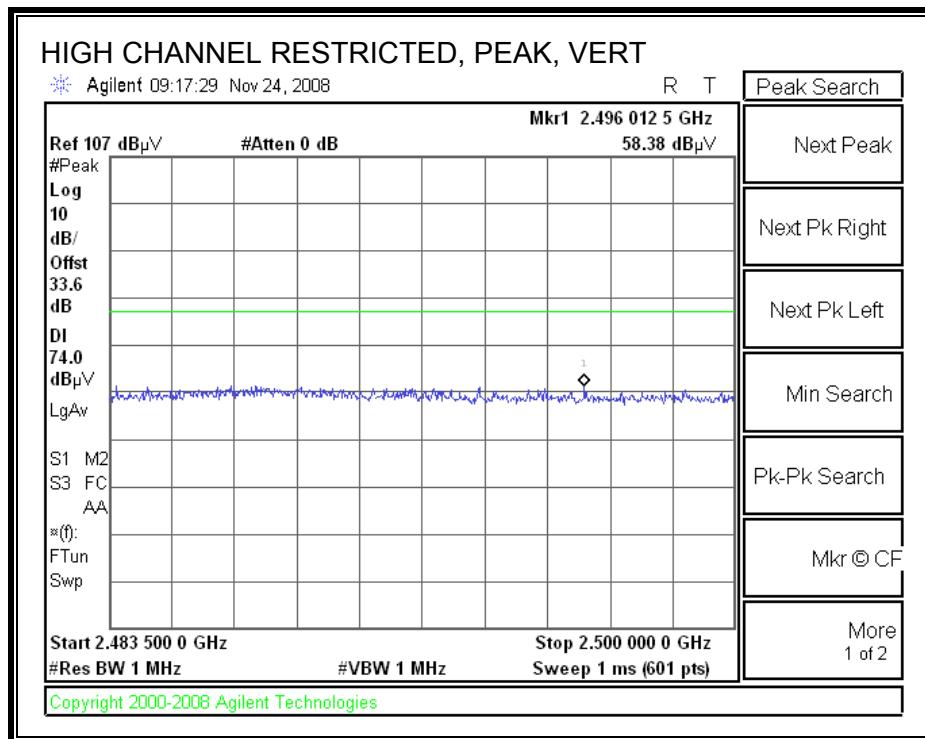
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



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



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



## HARMONICS AND SPURIOUS EMISSIONS

### High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Company: Qualcomm

Project #: 08U12127

Date: 11/24/2008

Test Engineer: Chin Pang

Configuration: EUT/Dipole Antenna

Mode: TX, b mode, WLAN

### Test Equipment:

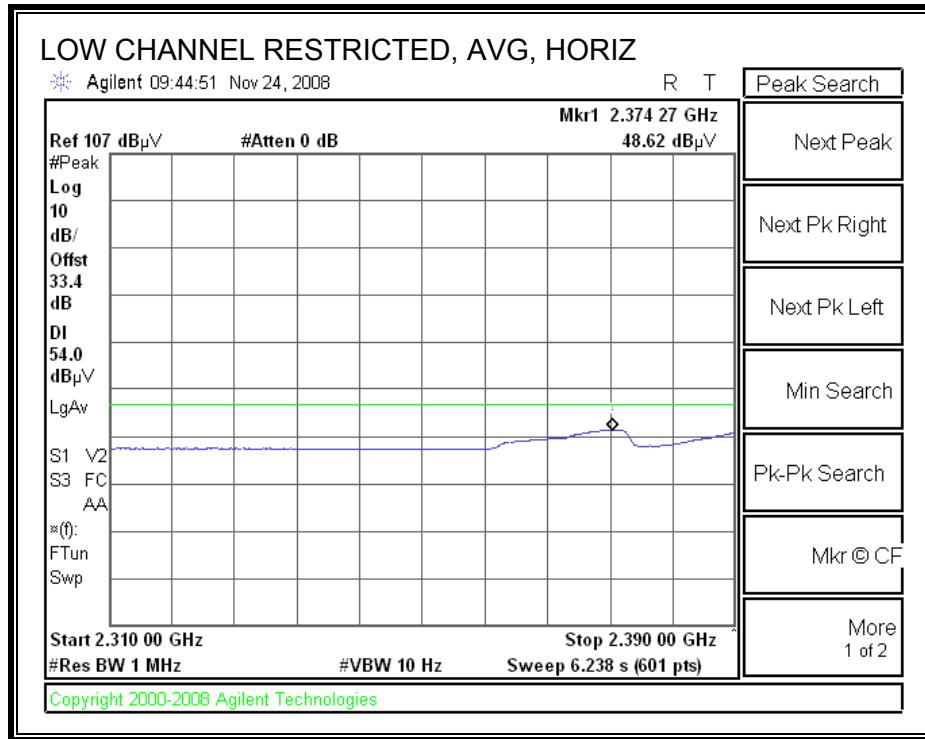
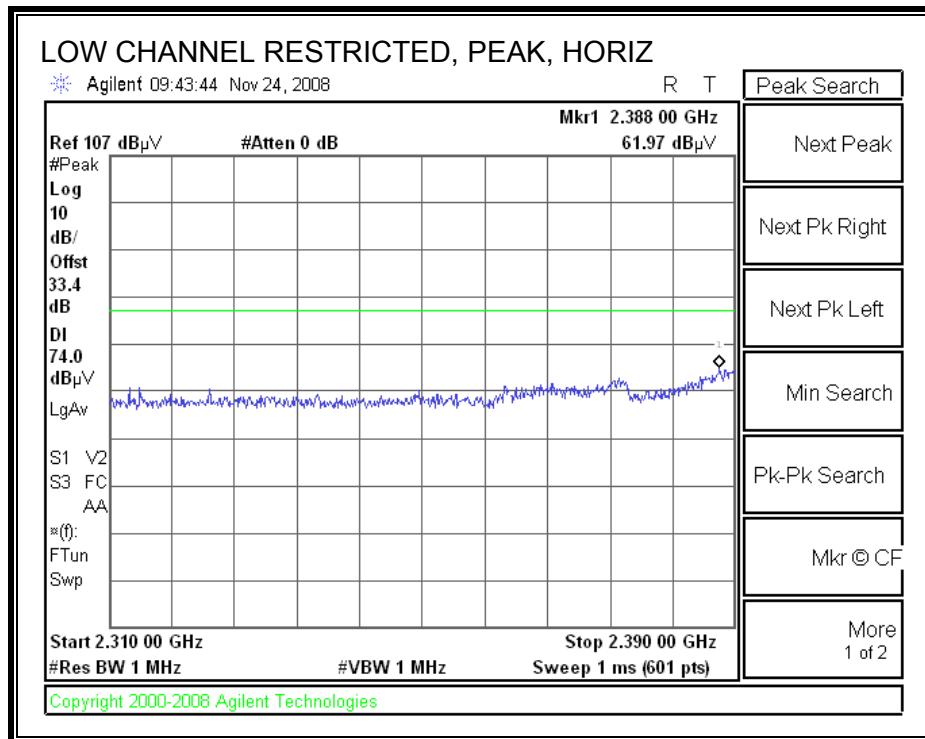
Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit											
T73; S/N: 6717 @3m	T34 HP 8449B			FCC 15.205											
<hr/>															
Hi Frequency Cables															
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter											
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_4.0GHz	Peak Measurements 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	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch, 2412MHz															
4.824	3.0	40.5	27.5	33.7	5.8	-34.8	0.0	0.6	45.8	32.8	74	54	-28.2	-21.2	V
4.824	3.0	39.4	27.0	33.7	5.8	-34.8	0.0	0.6	44.7	32.3	74	54	-29.3	-21.7	H
Mid Ch, 2437MHz															
4.874	3.0	40.0	27.0	33.8	5.8	-34.8	0.0	0.6	45.4	32.4	74	54	-28.6	-21.6	V
7.311	3.0	41.0	28.5	36.2	7.3	-34.1	0.0	0.6	51.0	38.5	74	54	-23.0	-15.5	V
4.874	3.0	39.2	26.8	33.8	5.8	-34.8	0.0	0.6	44.6	32.2	74	54	-29.4	-21.8	H
7.311	3.0	40.8	28.3	36.2	7.3	-34.1	0.0	0.6	50.8	38.3	74	54	-23.2	-15.7	H
High Ch, 2462MHz															
4.924	3.0	39.6	27.0	33.9	5.9	-34.8	0.0	0.6	45.1	32.5	74	54	-28.9	-21.5	V
7.386	3.0	40.6	28.0	36.3	7.3	-34.1	0.0	0.6	50.7	38.1	74	54	-23.3	-15.9	V
4.924	3.0	39.2	26.7	33.9	5.9	-34.8	0.0	0.6	44.7	32.2	74	54	-29.3	-21.8	H
7.386	3.0	40.2	27.8	36.3	7.3	-34.1	0.0	0.6	50.3	37.9	74	54	-23.7	-16.1	H

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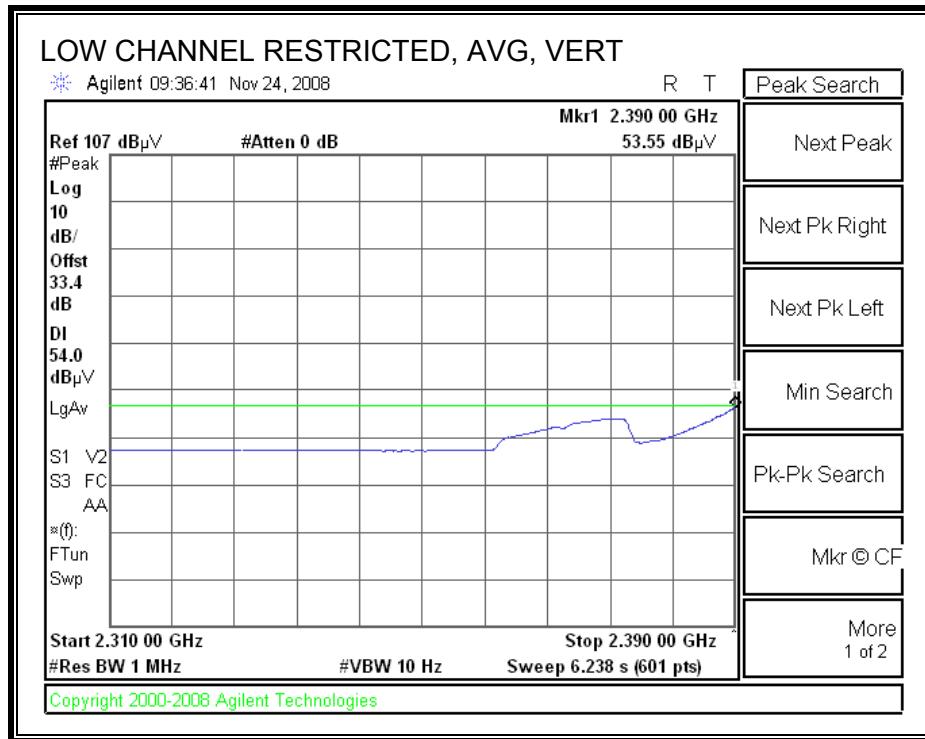
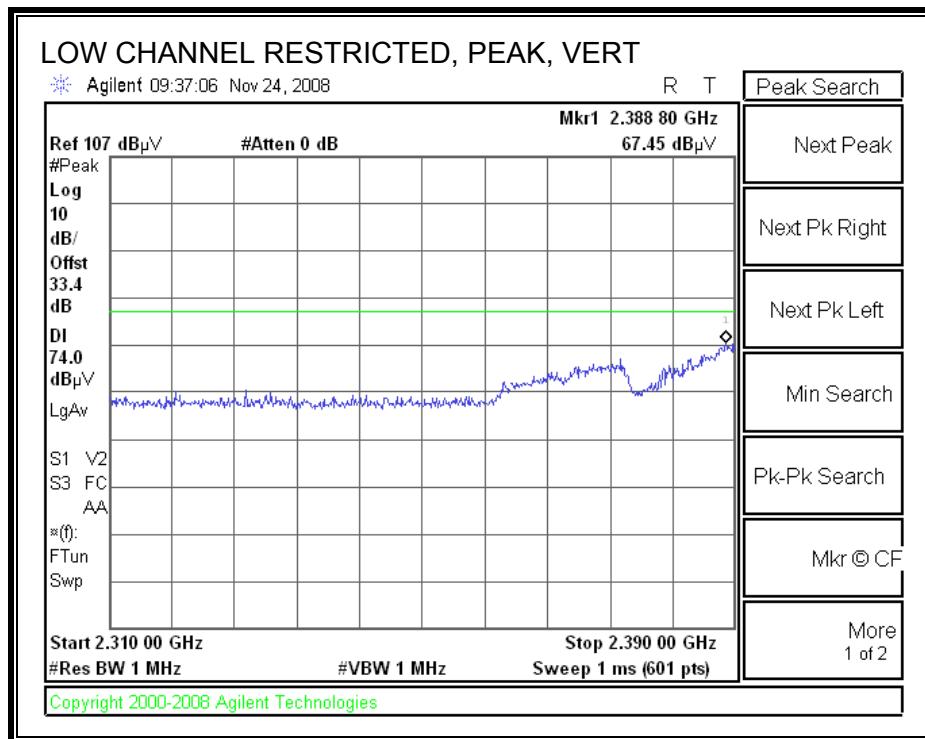
Note: No other emissions were detected above the system noise floor.

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		

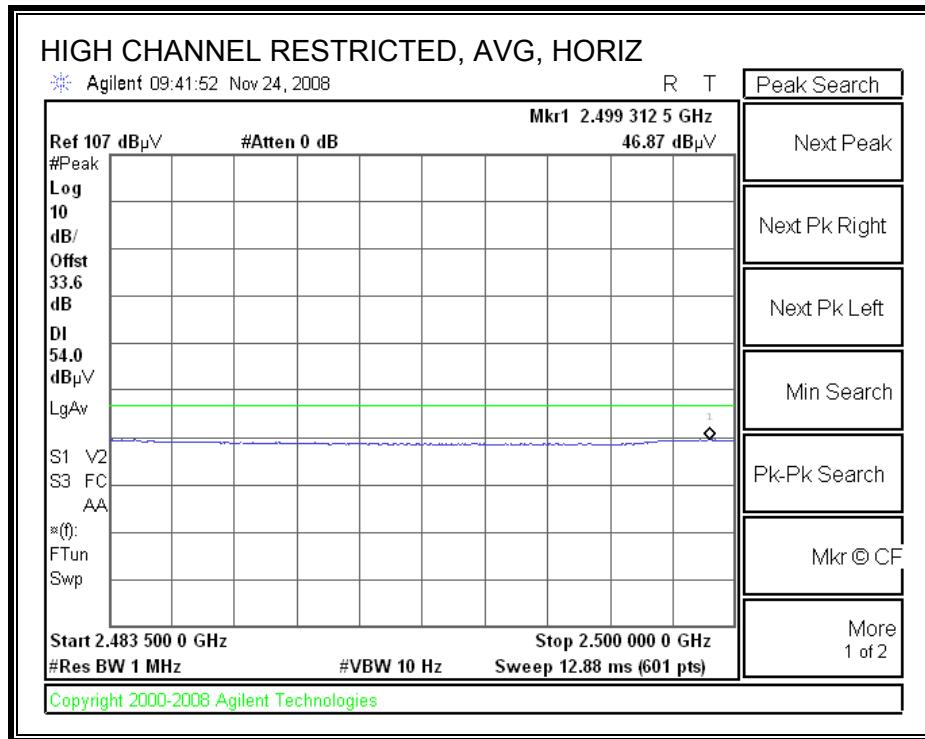
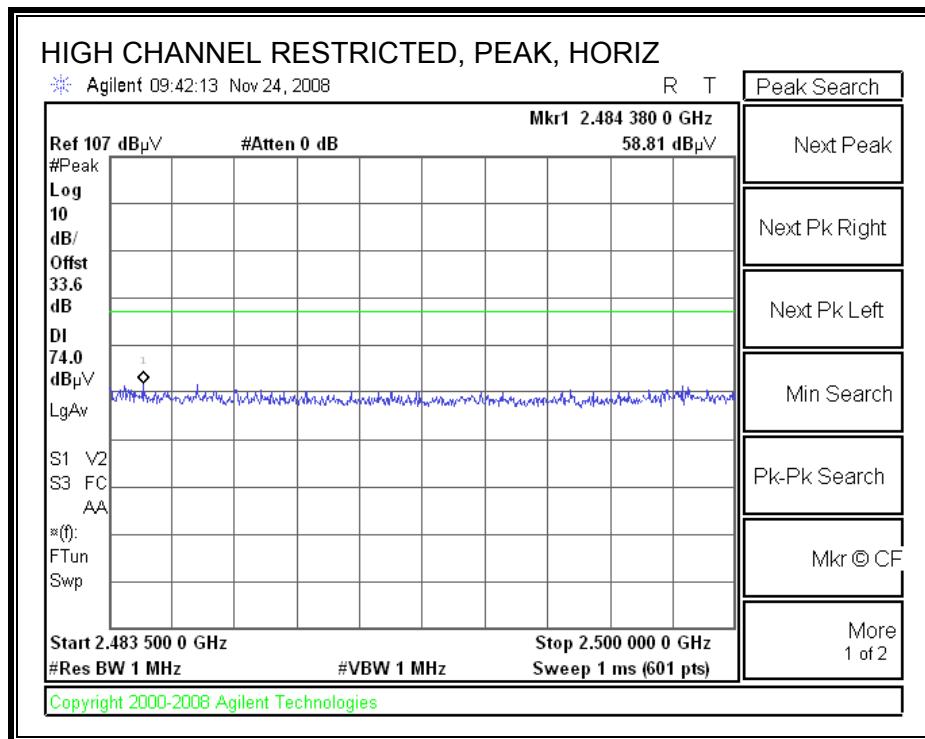
**8.2.2. TRANSMITTER ABOVE 1 GHz FOR 802.11g MODE**  
**RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**



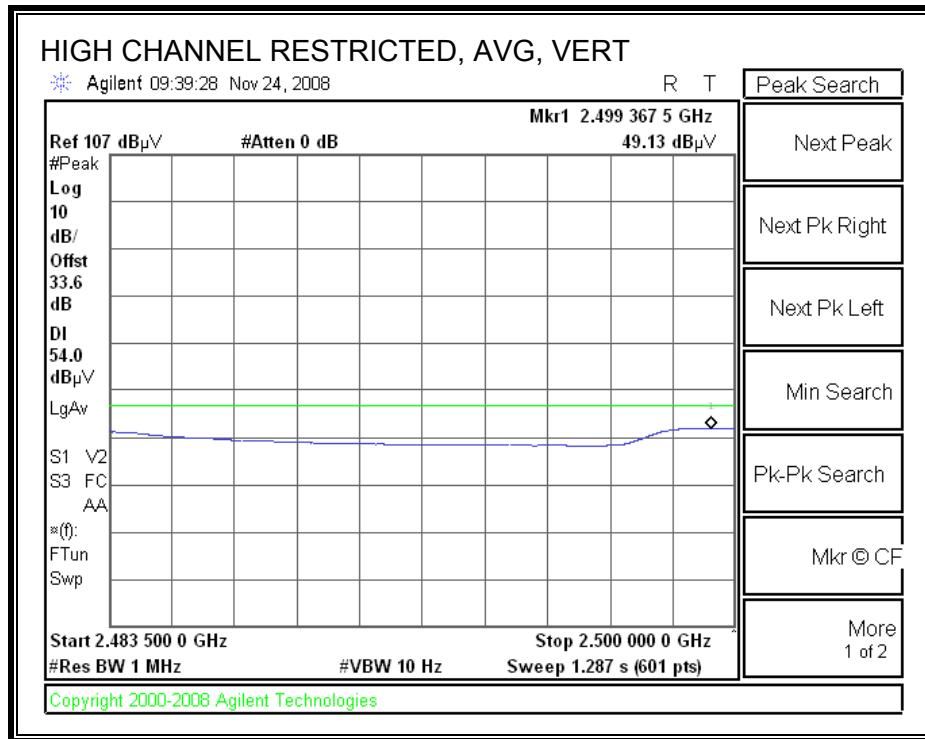
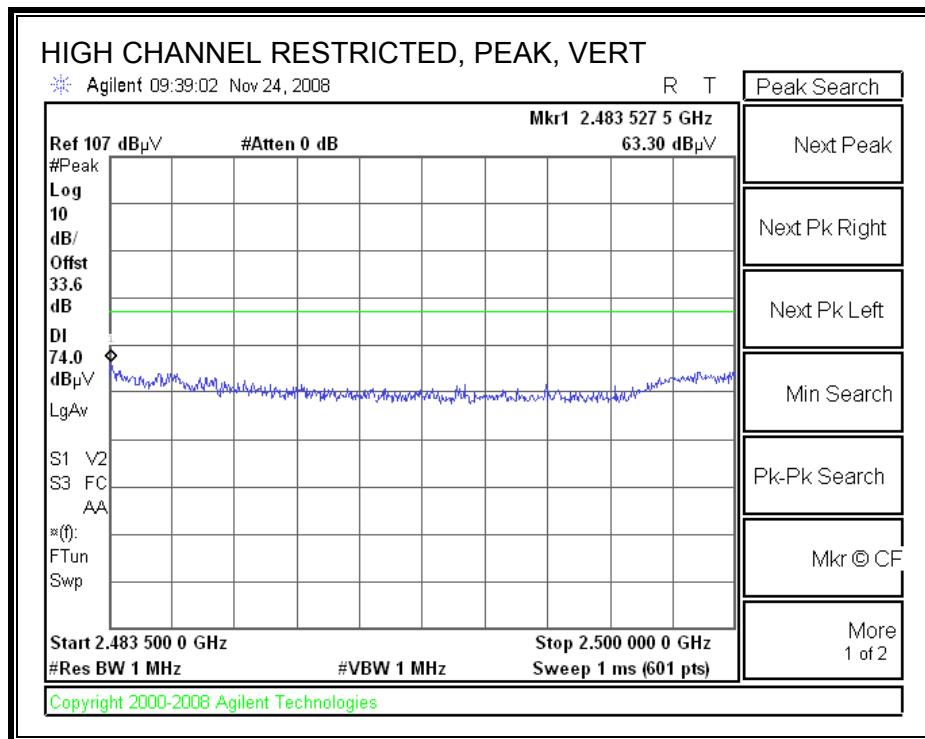
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



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



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



## HARMONICS AND SPURIOUS EMISSIONS

### High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Company: Qualcomm

Project #: 08U12127

Date: 11/24/2008

Test Engineer: Chin Pang

Configuration: EUT/Dipole Antenna

Mode: TX, g mode, WLAN

### Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit											
T73; S/N: 6717 @3m	T34 HP 8449B			FCC 15.205											
<hr/>															
Hi Frequency Cables															
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter											
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_4.0GHz	Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz, VBW=10Hz											
<hr/>															
f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<hr/>															
<b>Low Ch, 2412MHz</b>															
4.824	3.0	39.3	27.0	33.7	5.8	-34.8	0.0	0.6	44.6	32.3	74	54	-29.4	-21.7	V
4.824	3.0	38.9	26.8	33.7	5.8	-34.8	0.0	0.6	44.2	32.1	74	54	-29.8	-21.9	H
<hr/>															
<b>Mid Ch, 2437MHz</b>															
4.874	3.0	40.2	27.3	33.8	5.8	-34.8	0.0	0.6	45.6	32.7	74	54	-28.4	-21.3	V
7.311	3.0	40.3	28.0	36.2	7.3	-34.1	0.0	0.6	50.3	38.0	74	54	-23.7	-16.0	V
4.874	3.0	39.3	26.5	33.8	5.8	-34.8	0.0	0.6	44.7	31.9	74	54	-29.3	-22.1	H
7.311	3.0	40.2	28.0	36.2	7.3	-34.1	0.0	0.6	50.2	38.0	74	54	-23.8	-16.0	H
<hr/>															
<b>High Ch, 2462MHz</b>															
4.924	3.0	40.0	26.8	33.9	5.9	-34.8	0.0	0.6	45.5	32.3	74	54	-28.5	-21.7	V
7.386	3.0	40.5	27.7	36.3	7.3	-34.1	0.0	0.6	50.6	37.8	74	54	-23.4	-16.2	V
4.924	3.0	39.7	26.6	33.9	5.9	-34.8	0.0	0.6	45.2	32.1	74	54	-28.8	-21.9	H
7.386	3.0	40.8	27.7	36.3	7.3	-34.1	0.0	0.6	50.9	37.8	74	54	-23.1	-16.2	H
<hr/>															

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

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

### 8.3.1. RECEIVER ABOVE 1 GHz

#### High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Company: Qualcomm

Project #: 08U12127

Date: 11/24/2008

Test Engineer: Chin Pang

Configuration: EUT/Dipole Antenna

Mode: RX, WLAN

#### Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T34 HP 8449B			FCC 15.209
Hi Frequency Cables				
3' cable 22807700 12' cable 22807600 20' cable 22807500				
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
			HPF_4.0GHz	
				Peak Measurements RBW=VBW=1MHz
				Average Measurements RBW=1MHz; VBW=10Hz

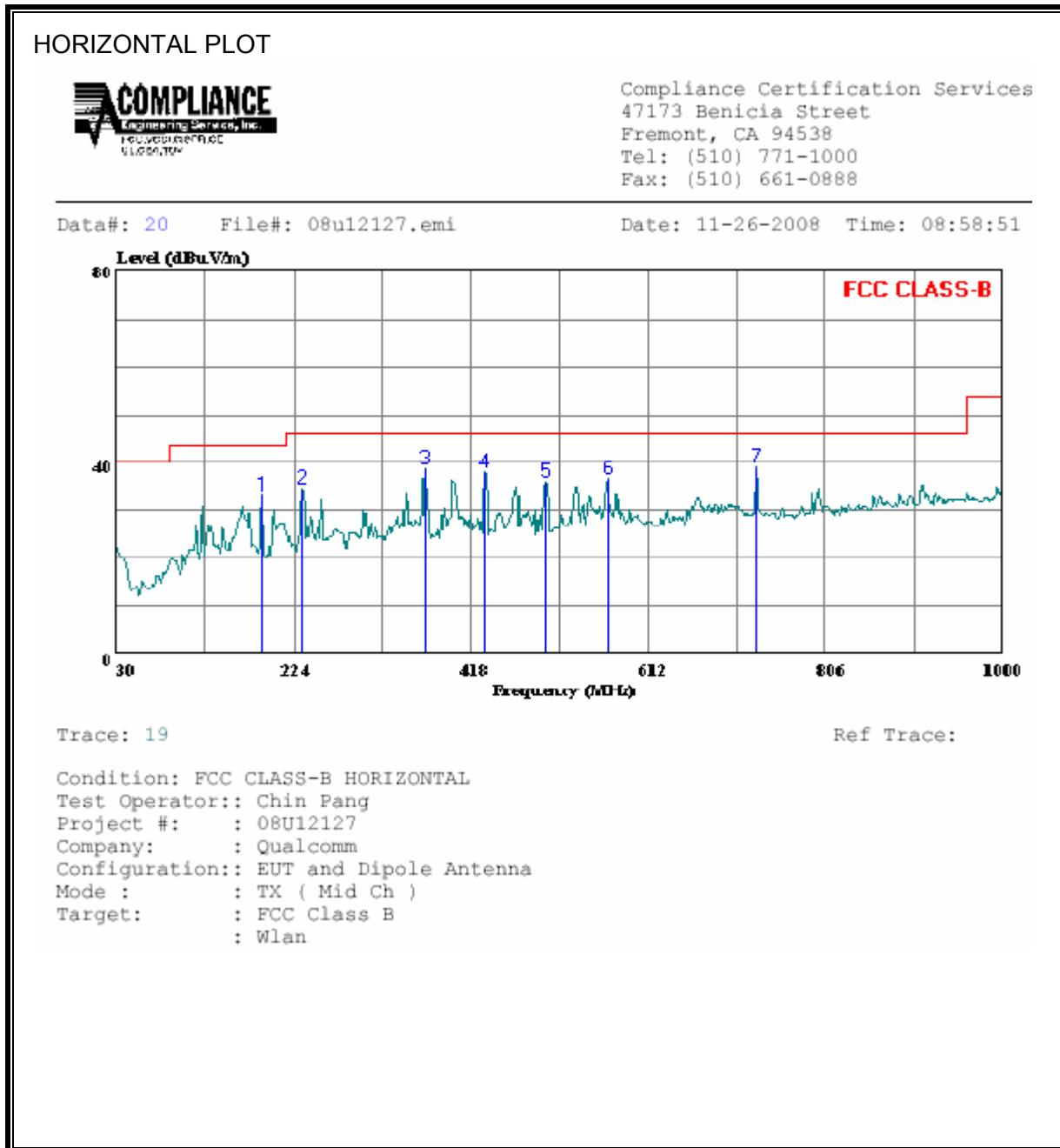
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Mid Ch, 2412MHz															
1.325	3.0	59.9	36.0	26.6	2.7	-37.8	0.0	0.0	51.4	27.5	74	54	-22.6	-26.5	V
1.500	3.0	54.0	42.2	27.1	2.9	-37.6	0.0	0.0	46.4	34.6	74	54	-27.6	-19.4	V
2.153	3.0	52.7	40.6	28.7	3.6	-36.7	0.0	0.0	48.4	36.3	74	54	-25.6	-17.7	V
1.325	3.0	54.1	34.9	26.6	2.7	-37.8	0.0	0.0	45.6	26.4	74	54	-28.4	-27.6	H
1.500	3.0	49.0	40.3	27.1	2.9	-37.6	0.0	0.0	41.4	32.7	74	54	-32.6	-21.3	H
2.153	3.0	50.2	38.3	28.7	3.6	-36.7	0.0	0.0	45.9	34.0	74	54	-28.1	-20.0	H

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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	

## 8.4. WORST-CASE BELOW 1 GHZ

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



HORIZONTAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	189.080	47.19	-13.89	33.30	43.50	-10.20	Peak
2	232.730	47.64	-13.15	34.49	46.00	-11.51	Peak
3	366.590	47.91	-9.16	38.75	46.00	-7.25	Peak
4	431.580	45.31	-7.11	38.20	46.00	-7.80	Peak
5	499.480	40.94	-4.79	36.15	46.00	-9.85	Peak
6	567.380	40.14	-3.48	36.66	46.00	-9.34	Peak
7	730.340	39.29	-0.04	39.25	46.00	-6.75	Peak

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

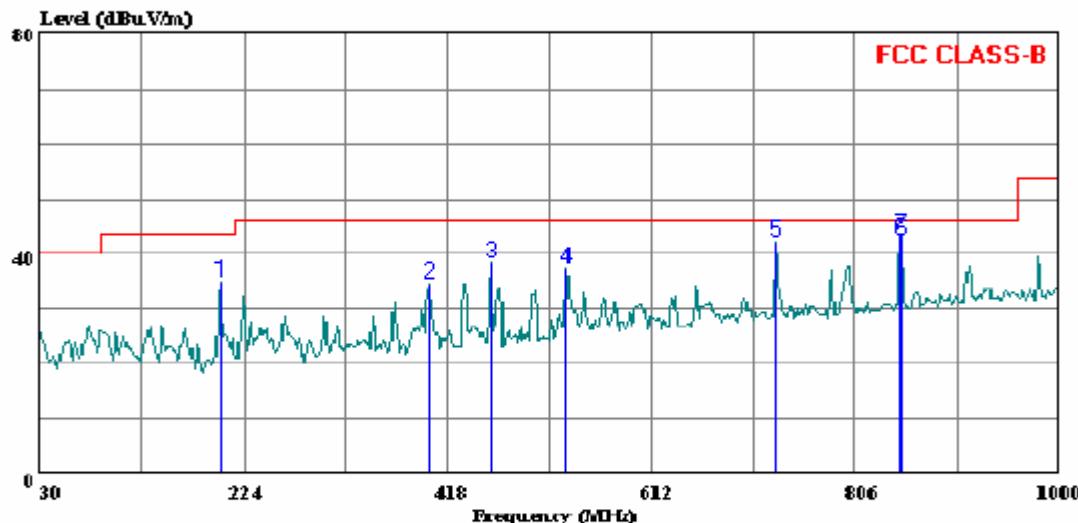
VERTICAL PLOT



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

Data#: 14 File#: 08U12127.emi

Date: 11-26-2008 Time: 08:44:50



Trace: 11

Ref Trace:

Condition: FCC CLASS-B VERTICAL  
Test Operator:: Chin Pang  
Project #: : 08U12127  
Company: : Qualcomm  
Configuration:: EUT and Dipole Antenna  
Mode : : TX ( Mid Ch )  
Target: : FCC Class B  
: WLAN

VERTICAL DATA

		Read		Limit	Over	
	Freq	Level	Factor	Level	Line	Limit
	MHz	dBuV		dB	dBuV/m	dBuV/m
1	201.690	47.97	-12.98	34.99	43.50	-8.51 Peak
2	400.540	42.70	-8.18	34.52	46.00	-11.48 Peak
3	458.740	44.46	-6.18	38.28	46.00	-7.72 Peak
4	531.490	41.54	-4.18	37.36	46.00	-8.64 Peak
5	730.340	42.16	-0.04	42.12	46.00	-3.88 Peak
6	848.680	40.68	1.74	42.42	46.00	-3.58 QP
7	848.680	41.78	1.74	43.52	46.00	-2.48 Peak

## 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/f	2.19/f		6
10–30	28	2.19/f		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

\* 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 ( $\mu$ T) or 12.57 milligauss (mG).

## CALCULATIONS

Given

$$E = \sqrt{(30 * P * G) / d}$$

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations, rearranging the terms to express the distance as a function of the remaining variables, changing to units of Power to mW and Distance to cm, and substituting the logarithmic form of power and gain yields:

$$d = 0.282 * 10^{((P + G) / 20) / \sqrt{S}}$$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm<sup>2</sup>

Rearranging terms to calculate the power density at a specific distance yields

$$S = 0.0795 * 10^{((P + G) / 10) / (d^2)}$$

The power density in units of mW/cm<sup>2</sup> is converted to units of W/m<sup>2</sup> by multiplying by a factor of 10.

## 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

Mode	Band	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	FCC Power Density (mW/cm <sup>2</sup> )	IC Power Density (W/m <sup>2</sup> )
11b	2.4 GHz	20.0	17.33	2.0	0.02	0.17
11g	2.4 GHz	20.0	22.89	2.0	0.06	0.61