



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

**CERTIFICATION TEST REPORT**

**FOR**

**Handheld Touch Screen IPOD Music Device with 802.11 b/g  
and Bluetooth radio functions**

**MODEL NUMBER: A1288**

**FCC ID: BCGA1288  
IC: 579C-A1288**

**REPORT NUMBER: 08U11969-1**

**ISSUE DATE: SEPTEMBER 02, 2008**

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	09/02/08	Initial Issue	T. Chan

## TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS.....	5
2. TEST METHODOLOGY .....	6
3. FACILITIES AND ACCREDITATION.....	6
4. CALIBRATION AND UNCERTAINTY .....	6
4.1. MEASURING INSTRUMENT CALIBRATION.....	6
4.2. MEASUREMENT UNCERTAINTY.....	6
5. EQUIPMENT UNDER TEST .....	7
5.1. DESCRIPTION OF EUT.....	7
5.2. MAXIMUM OUTPUT POWER.....	7
5.3. DESCRIPTION OF AVAILABLE ANTENNAS.....	7
5.4. SOFTWARE AND FIRMWARE.....	7
5.5. WORST-CASE CONFIGURATIONS .....	7
5.6. DESCRIPTION OF TEST SETUP.....	8
6. TEST AND MEASUREMENT EQUIPMENT .....	10
7. ANTENNA PORT TEST RESULTS .....	11
7.1. 802.11b MODE IN THE 2.4 GHz BAND.....	11
7.1.1. 6 dB BANDWIDTH .....	11
7.1.2. 99% BANDWIDTH .....	15
7.1.3. OUTPUT POWER .....	19
7.1.4. AVERAGE POWER .....	23
7.1.5. POWER SPECTRAL DENSITY .....	24
7.1.6. CONDUCTED SPURIOUS EMISSIONS.....	28
7.2. 802.11g MODE IN THE 2.4 GHz BAND.....	35
7.2.1. 6 dB BANDWIDTH .....	35
7.2.2. 99% BANDWIDTH .....	39
7.2.3. OUTPUT POWER .....	43
7.2.4. AVERAGE POWER .....	47
7.2.5. POWER SPECTRAL DENSITY .....	48
7.2.6. CONDUCTED SPURIOUS EMISSIONS.....	52
8. RADIATED TEST RESULTS .....	59
8.1. LIMITS AND PROCEDURE .....	59
8.2. TRANSMITTER ABOVE 1 GHz .....	60
8.2.1. TRANSMITTER ABOVE 1 GHz FOR 802.11b MODE IN THE 2.4 GHz BAND ..	60
8.2.2. TRANSMITTER ABOVE 1 GHz FOR 802.11g MODE IN THE 2.4 GHz BAND ..	69
8.3. RECEIVER ABOVE 1 GHz .....	78
8.4. WORST-CASE BELOW 1 GHz.....	79

9. SETUP PHOTOS.....81

## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** APPLE, INC.  
1 INFINITY LOOP  
CUPERTINO, CALIFORNIA 95014, U.S.A

**EUT DESCRIPTION:** Handheld Touch Screen IPOD Music Device with 802.11 b/g and Bluetooth radio functions

**MODEL:** A1288

**SERIAL NUMBER:** 9C8310HP2013

**DATE TESTED:** AUGUST 18 - SEPTEMBER 02, 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. 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. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:



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THU CHAN  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

Tested By:



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VIEN TRAN  
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.

## 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 a Handheld Touch Screen IPOD Music Device with 802.11 b/g and Bluetooth radio functions. The radio module is manufactured by Komatsu Murata Manufacturing.

### 5.2. MAXIMUM OUTPUT POWER

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

Frequency Band (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	18.57	71.9
2412 - 2462	802.11g	24.24	265.5

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a Circular Polar antenna maximum gain of 1.5 dBi.

### 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was rev 4.173.2.0

The EUT driver software installed in the host support equipment during testing was None UI 5.F116 Diagnostic

The test utility software used during testing was WL Tool.exe

### 5.5. WORST-CASE CONFIGURATIONS

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.

EUT has been evaluated at X, Y, and Z-axis. The highest measured output power was at Y-Axis.

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

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Apple	A1181	AOU253727	DoC
AC Adapter	Dongguan Samsung	A1184	611-0565	NA
AC Adapter	Flextronics	A1265	1X8100000185	NA
Jig Card	Apple	NA	NA	NA

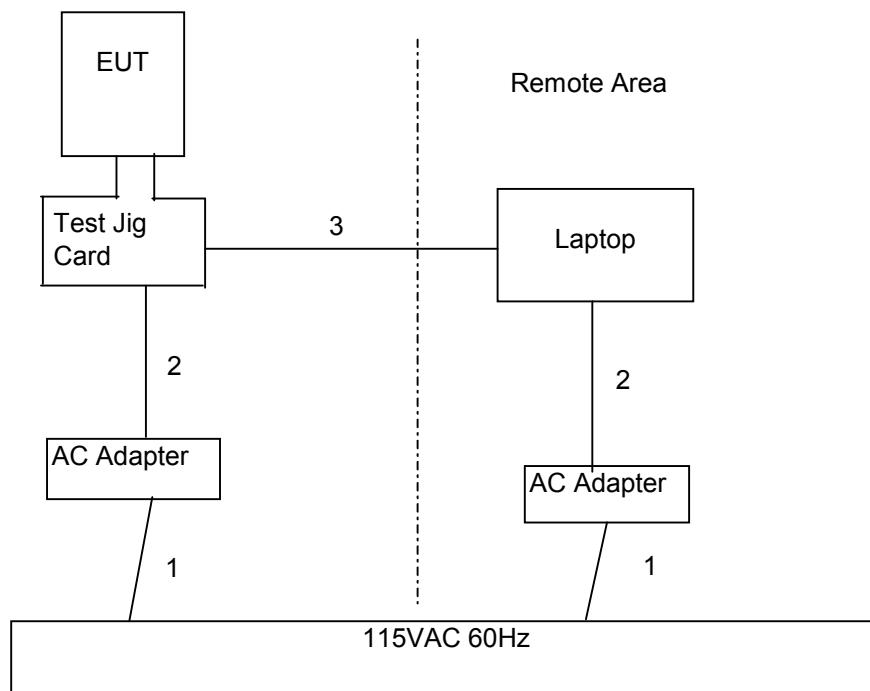
### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Un-shielded	2m	NA
2	DC	1	DC	Un-shielded	2m	NA
3	USB	1	Jig Card	Un-shielded	2m	NA

### TEST SETUP

The EUT is connected to a Jig card and 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 Due
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4407B	C01101	01/22/09
Power Meter	Agilent / HP	438B	N02890	06/20/09
EMI Receiver, 2.9 GHz	Agilent / HP	8542E	C00957	06/12/09
RF Filter Section, 2.9 GHz	Agilent / HP	85420E	C00958	06/12/09
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	09/28/08
Power Sensor, 18 GHz	Agilent / HP	8481A	N02784	10/22/09
Antenna, Horn, 18 GHz	ETS	3117	C01006	04/22/09
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	09/29/08
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	03/31/09
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	08/03/09
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	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.

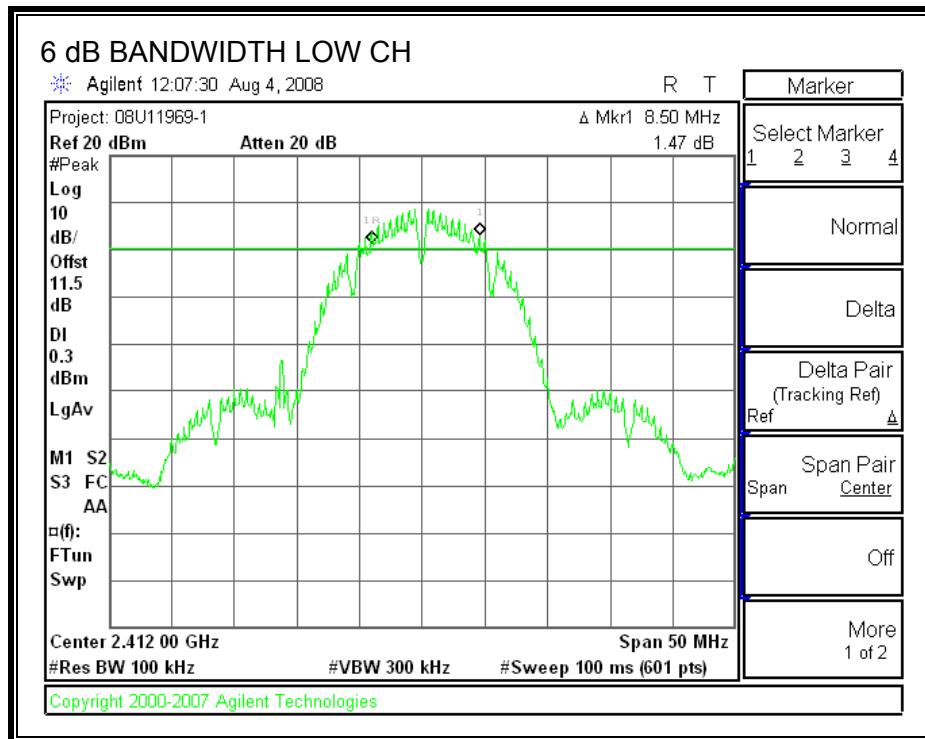
##### TEST PROCEDURE

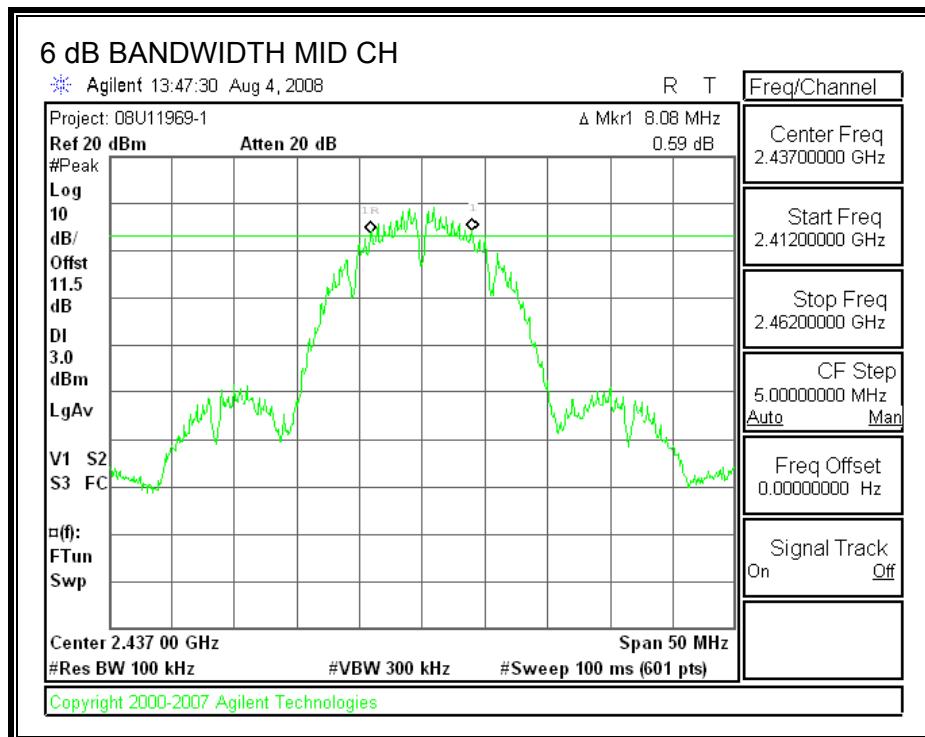
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

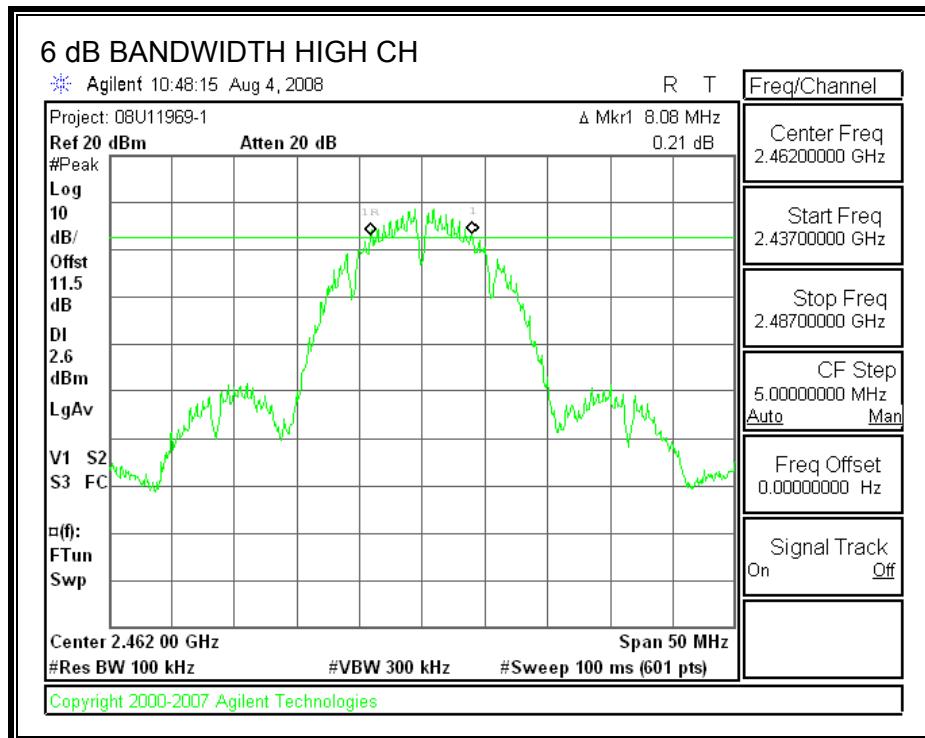
##### RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	8.5	0.5
Middle	2437	8.08	0.5
High	2462	8.08	0.5

**6 dB BANDWIDTH**







### 7.1.2. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

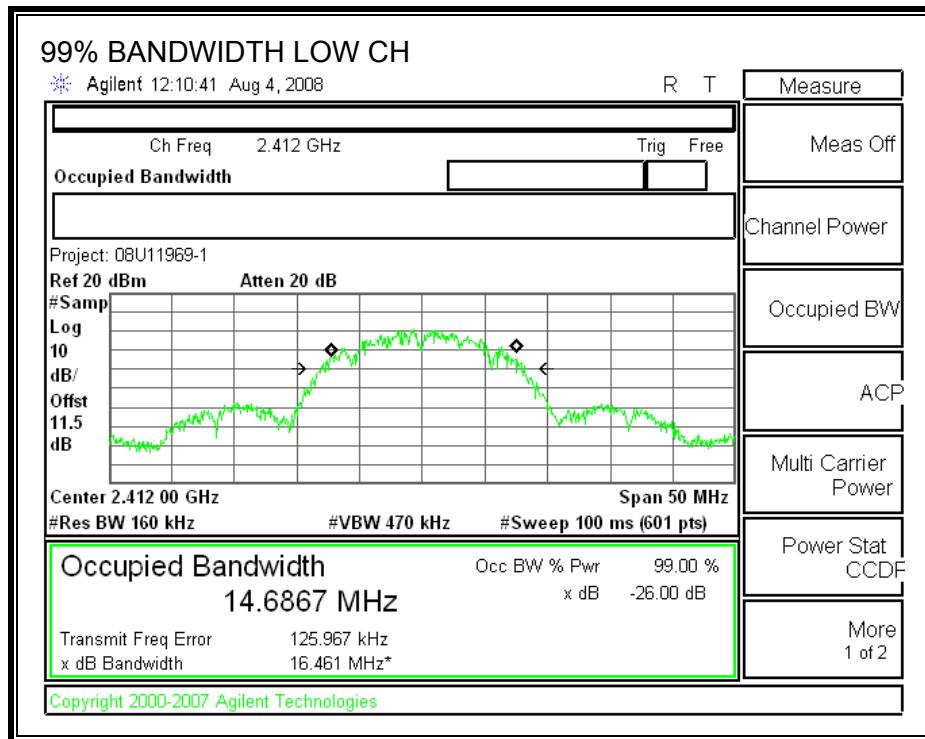
#### TEST PROCEDURE

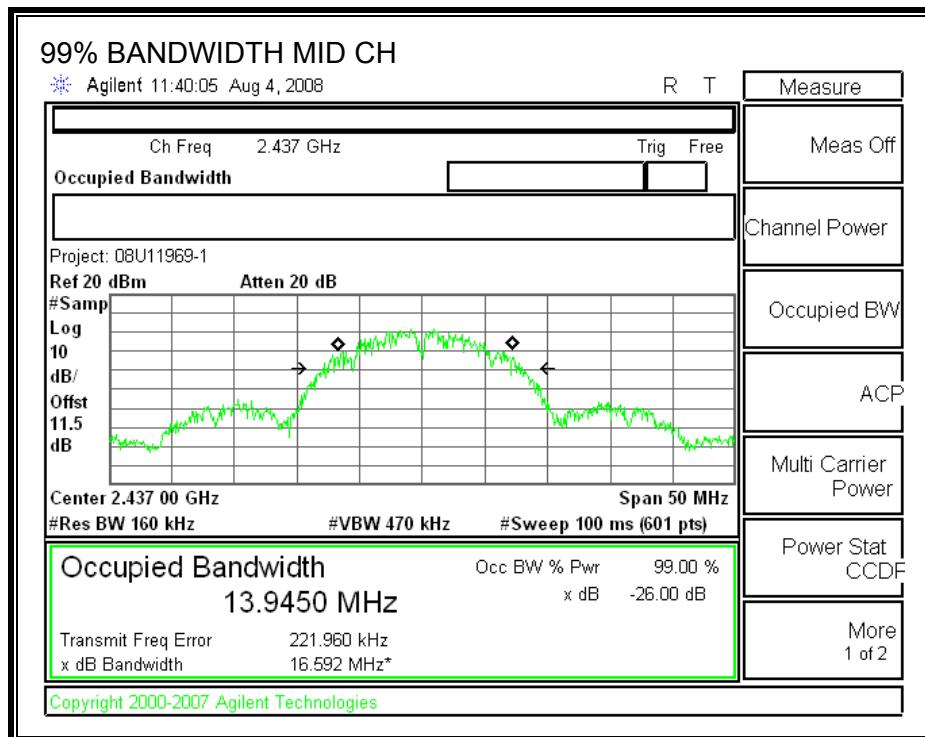
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

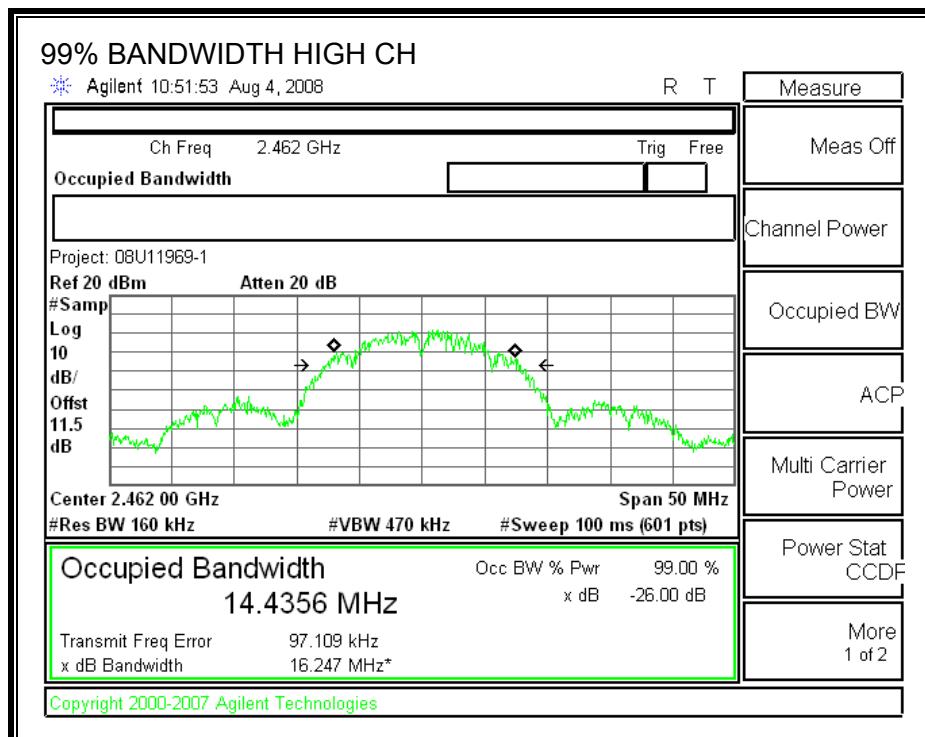
#### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	14.6867
Middle	2437	13.945
High	2462	14.4356

**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.

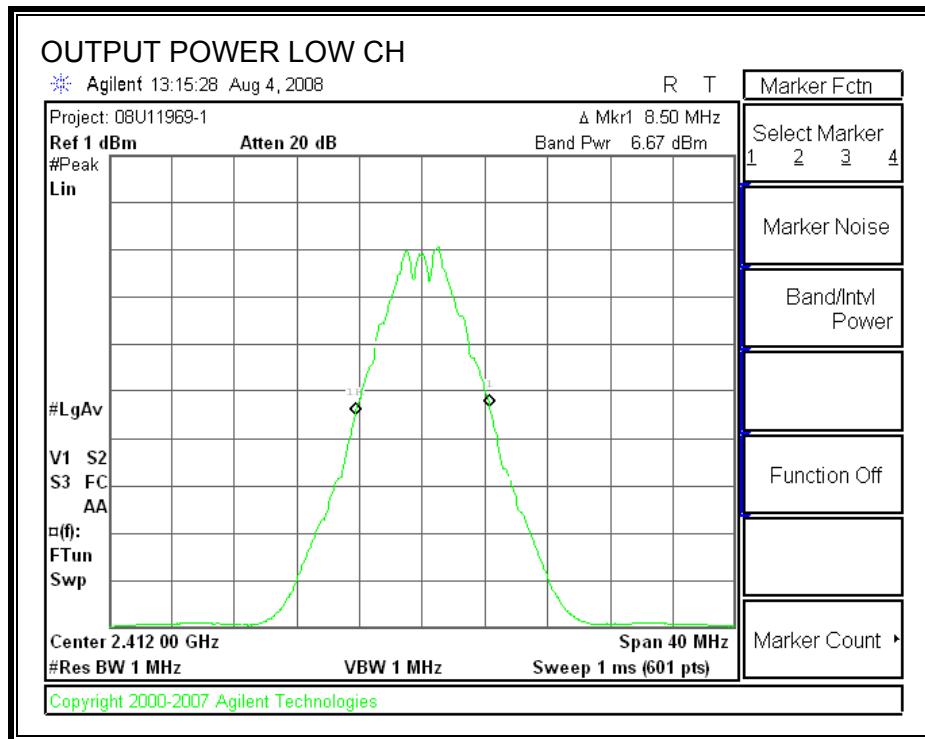
#### TEST PROCEDURE

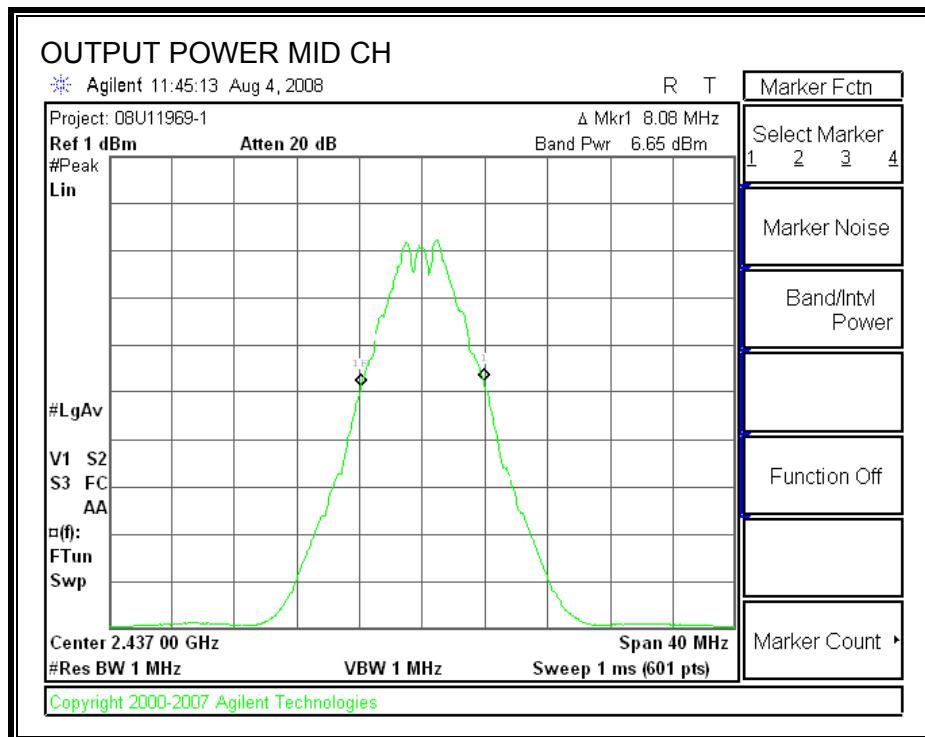
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

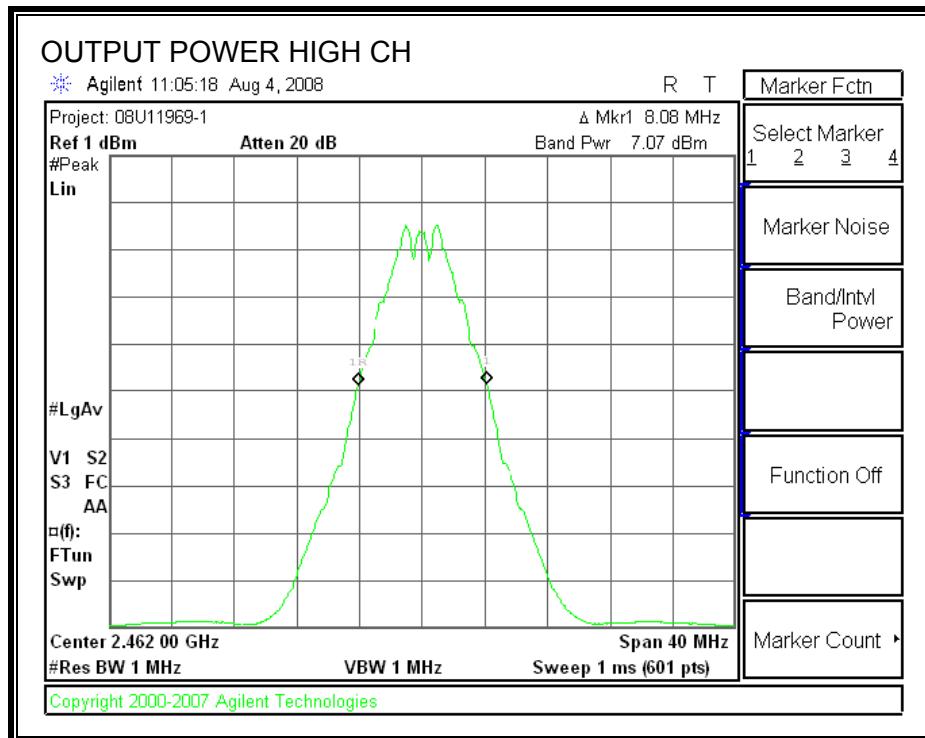
#### RESULTS

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	6.67	11.5	18.17	30	-11.83
Middle	2437	6.65	11.5	18.15	30	-11.85
High	2462	7.07	11.5	18.57	30	-11.43

**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)
Low	2412	16.66
Middle	2437	16.36
High	2462	16.18

### 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.

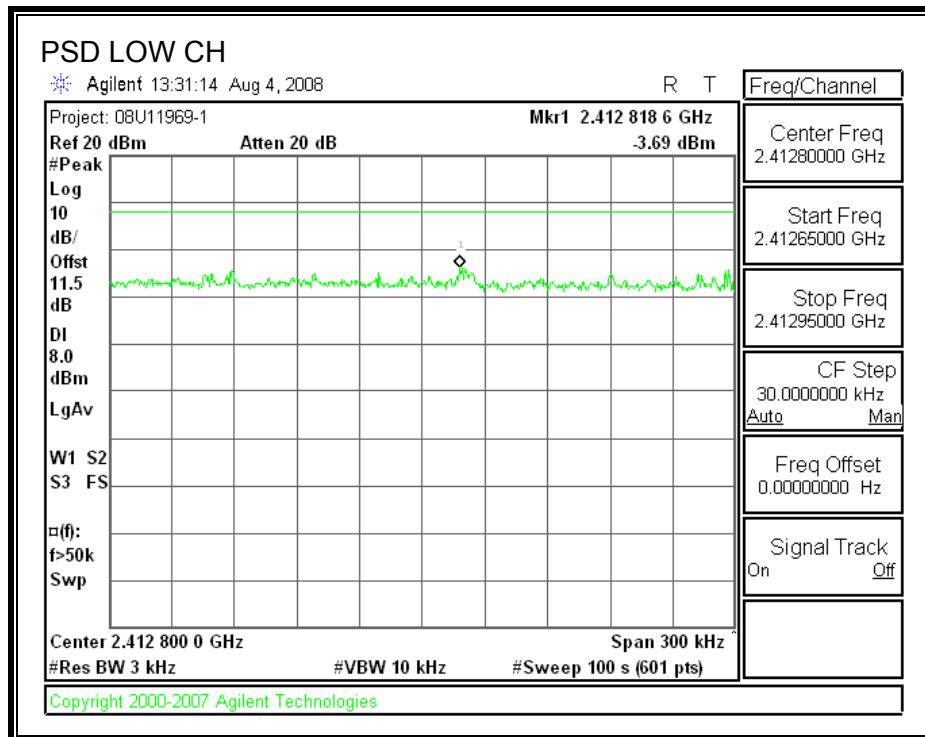
#### TEST PROCEDURE

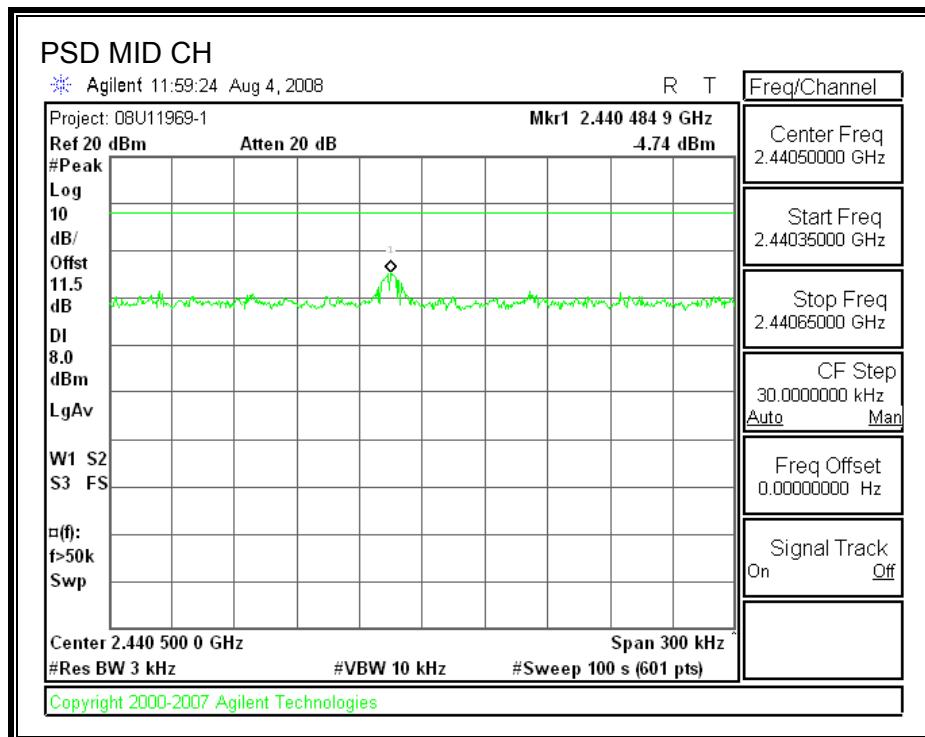
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

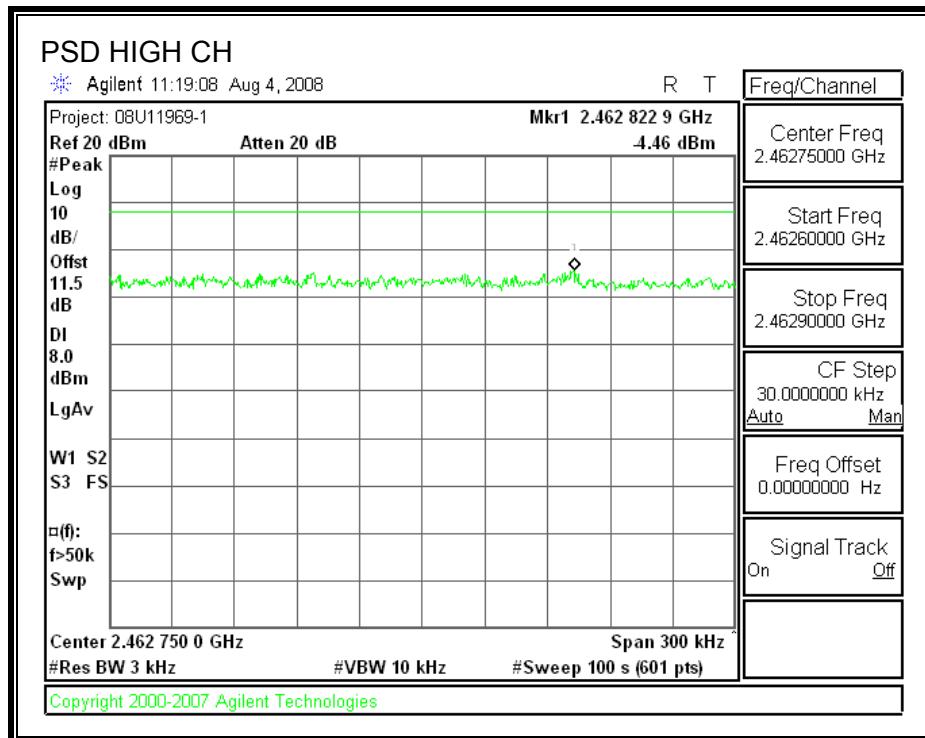
#### RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-3.69	8	-11.69
Middle	2437	-4.74	8	-12.74
High	2462	-4.46	8	-12.46

**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.

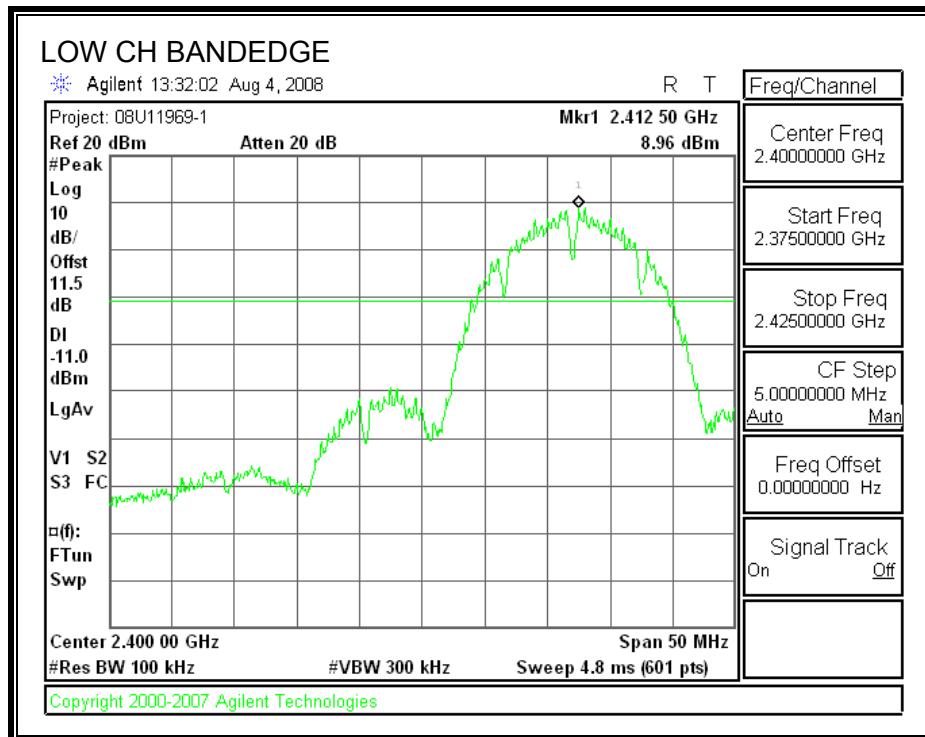
#### TEST PROCEDURE

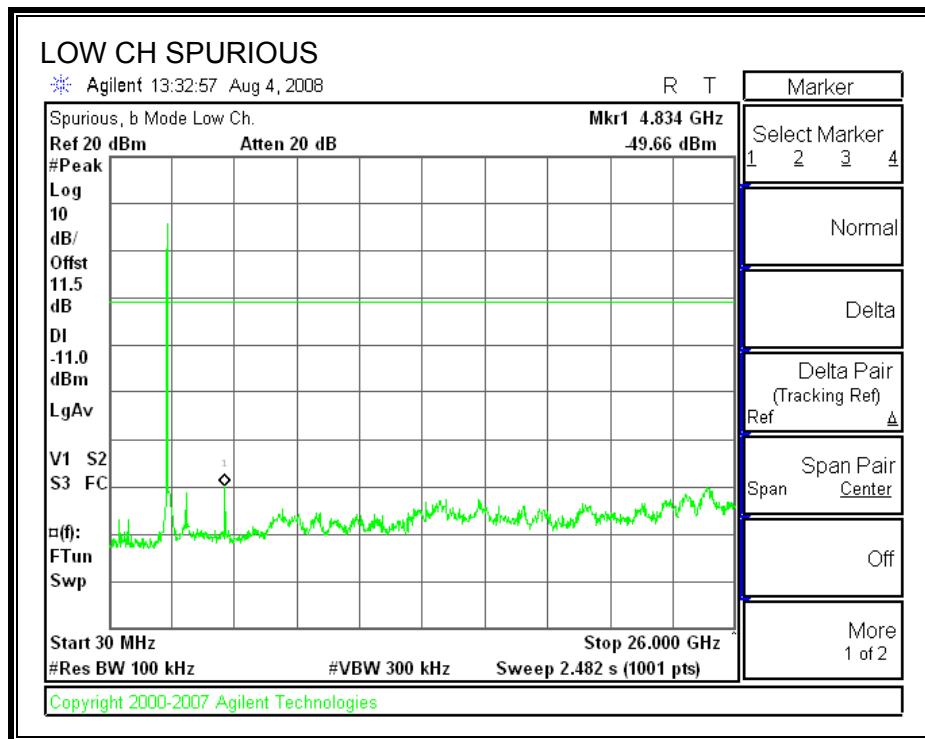
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

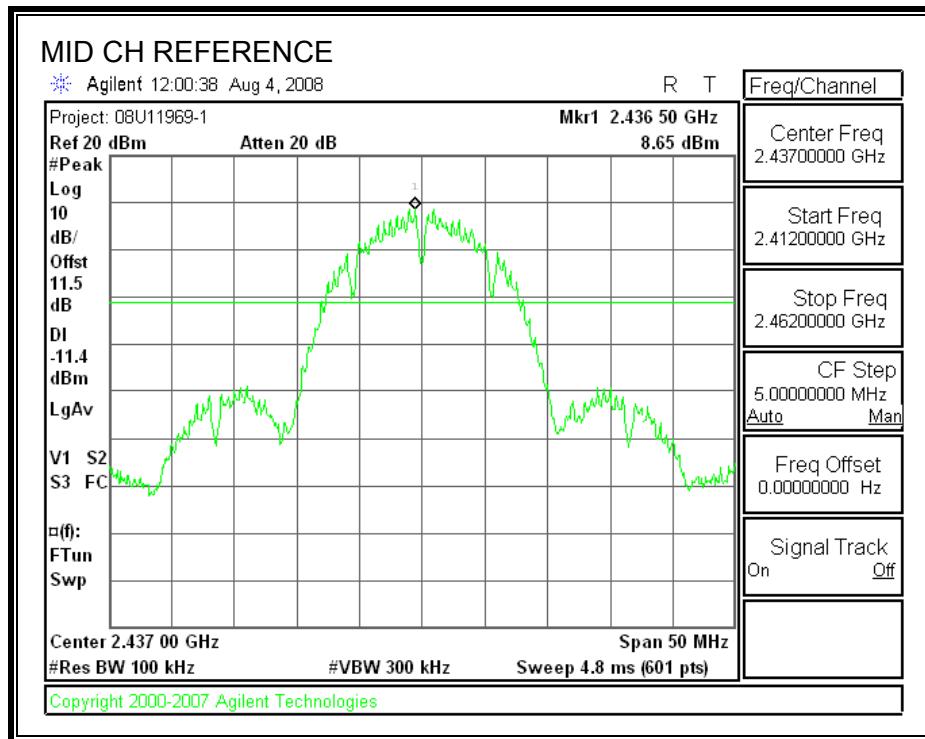
#### RESULTS

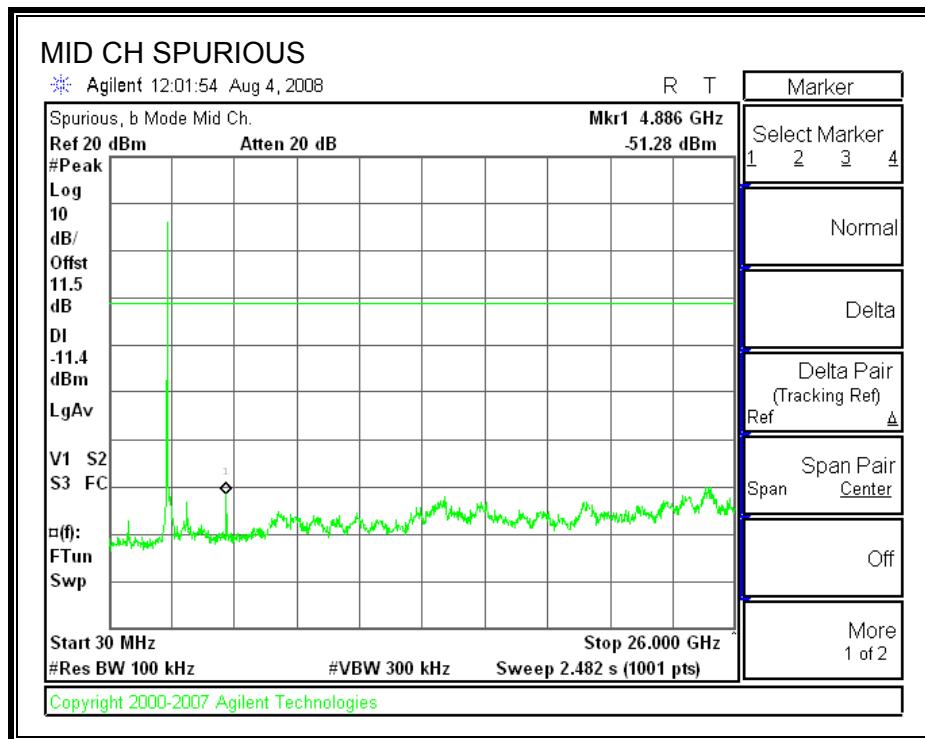
**SPURIOUS EMISSIONS, LOW CHANNEL**



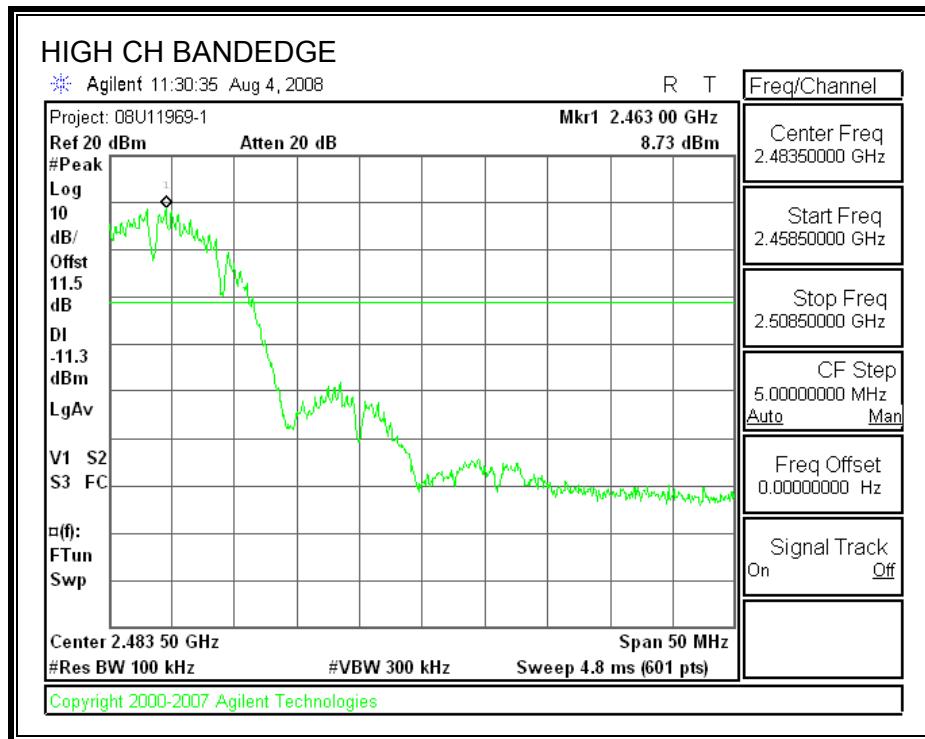


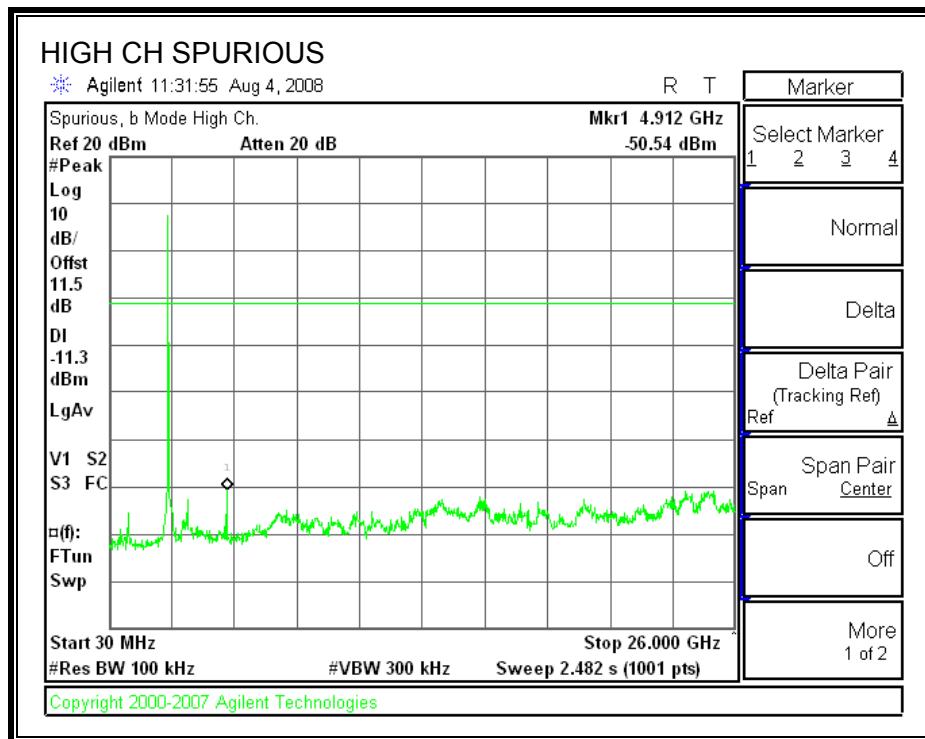
**SPURIOUS EMISSIONS, MID CHANNEL**





**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.

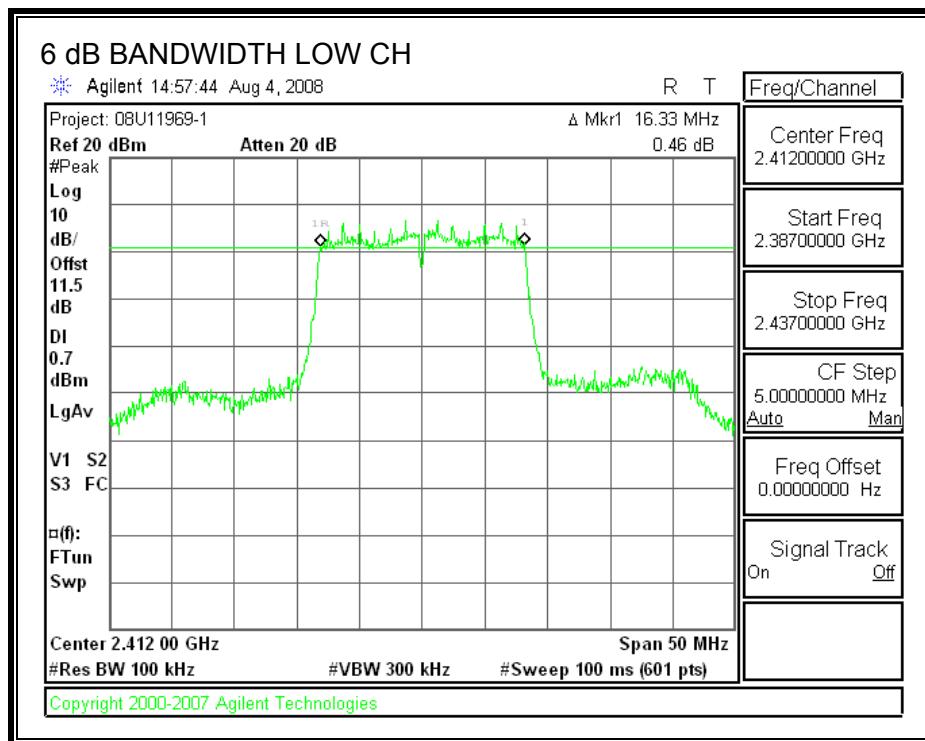
#### TEST PROCEDURE

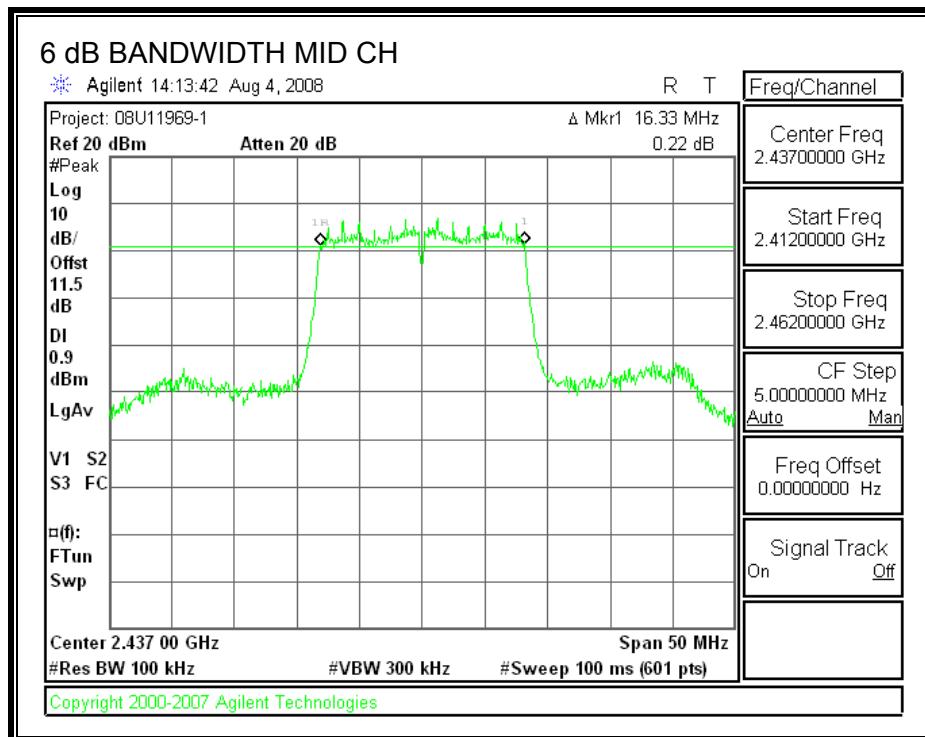
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

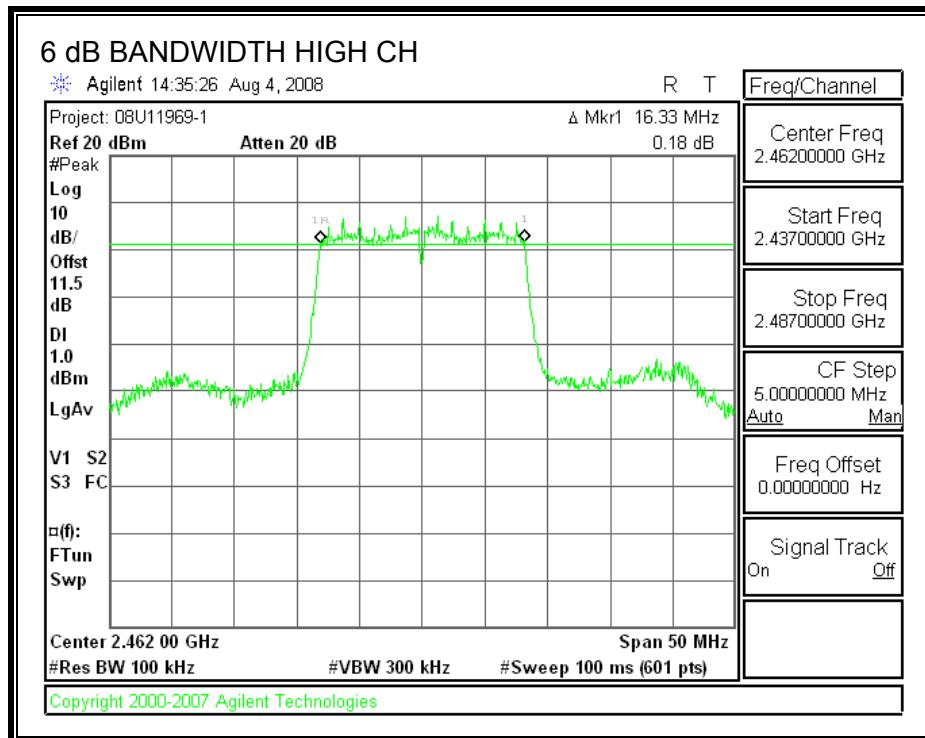
#### RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.33	0.5
Middle	2437	16.33	0.5
High	2462	16.33	0.5

**6 dB BANDWIDTH**







### 7.2.2. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

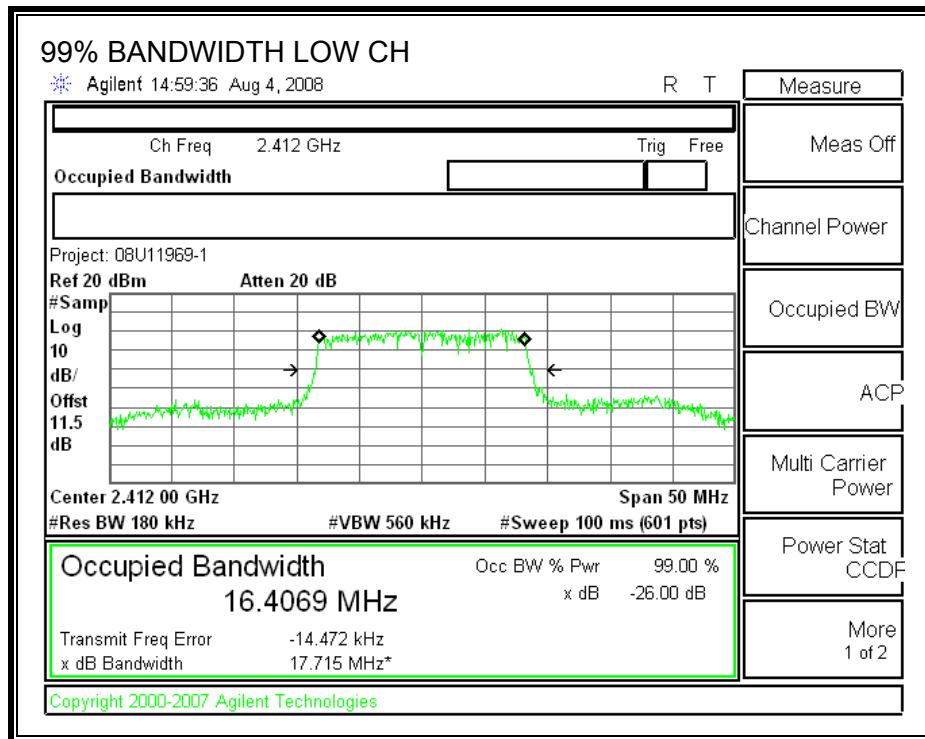
#### TEST PROCEDURE

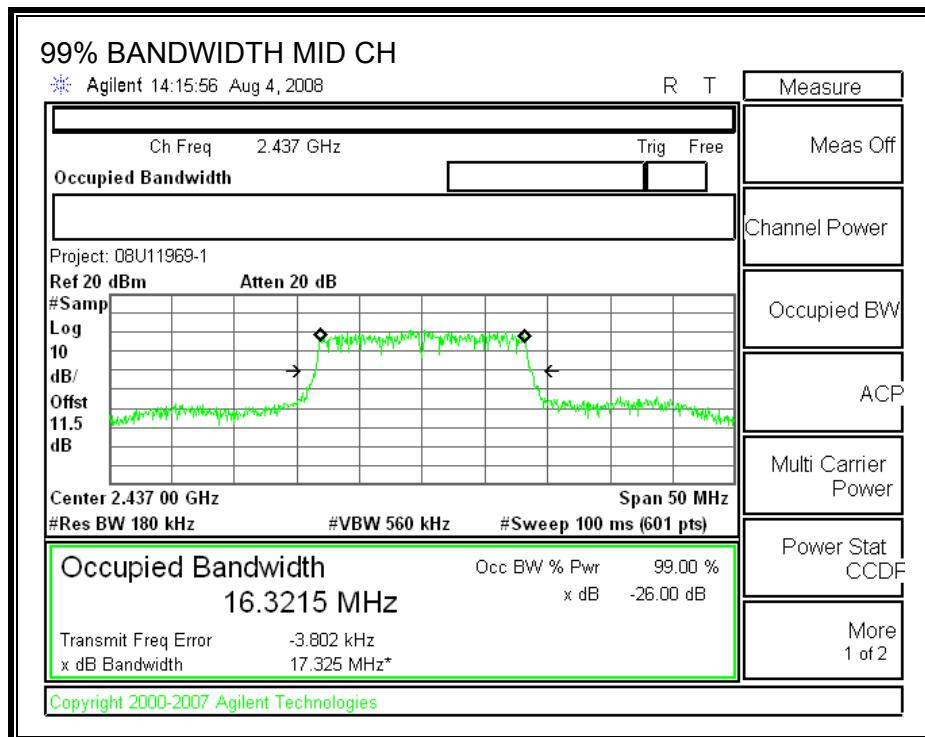
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

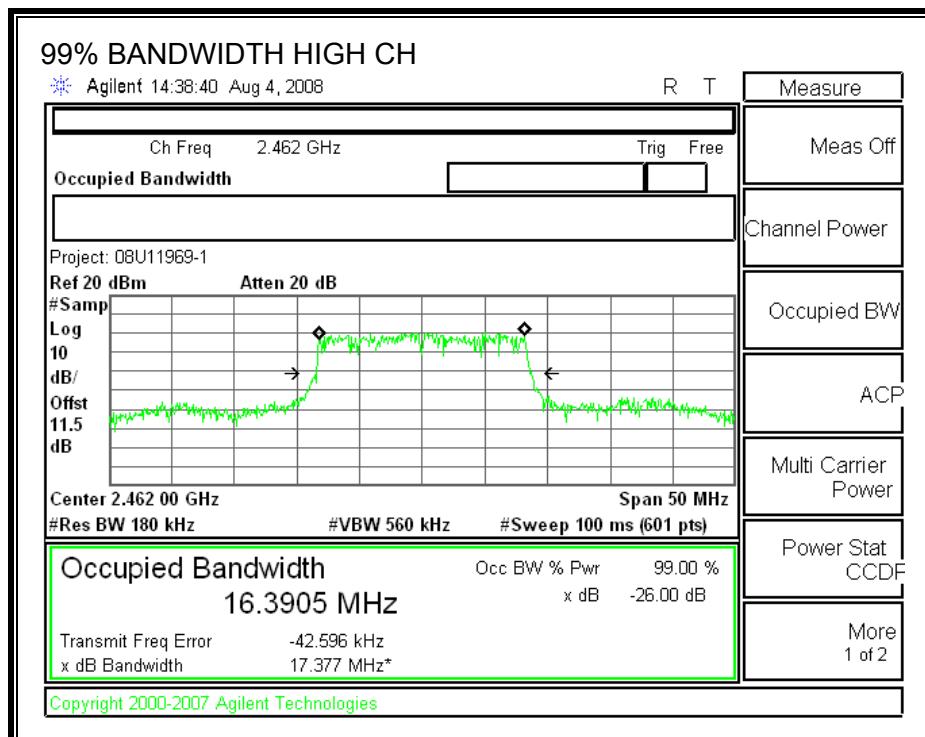
#### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.4069
Middle	2437	16.3215
High	2462	16.3905

**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.

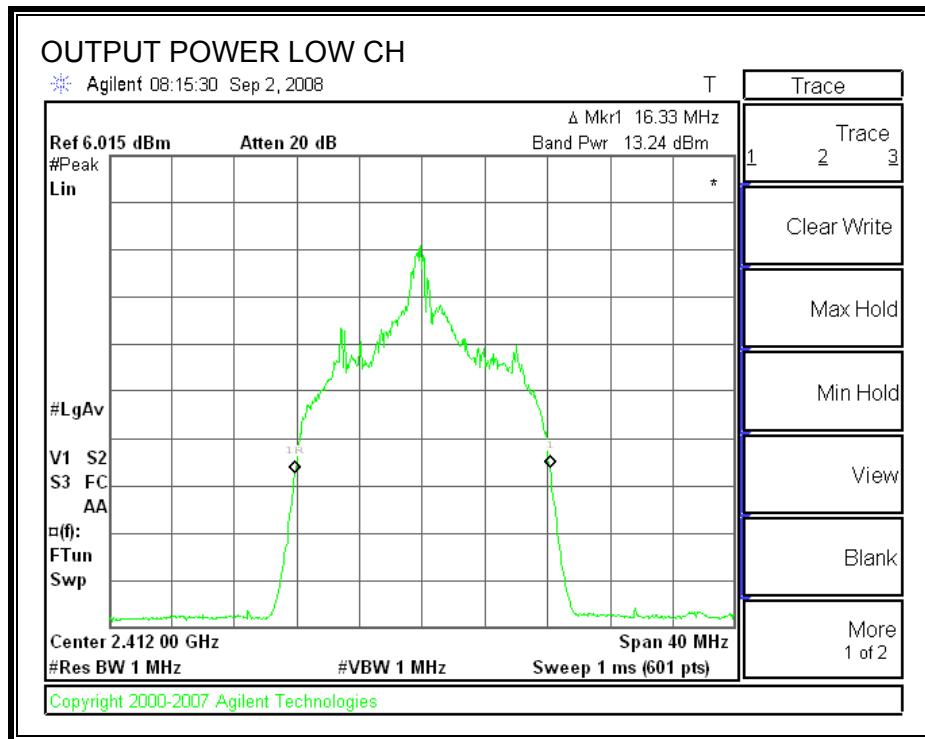
#### TEST PROCEDURE

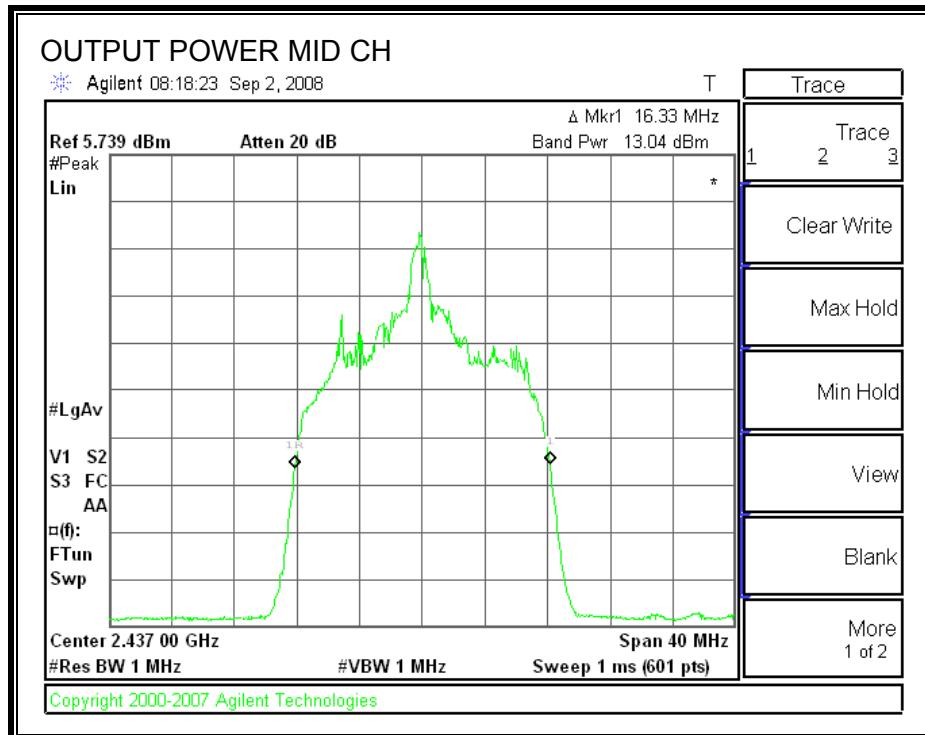
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

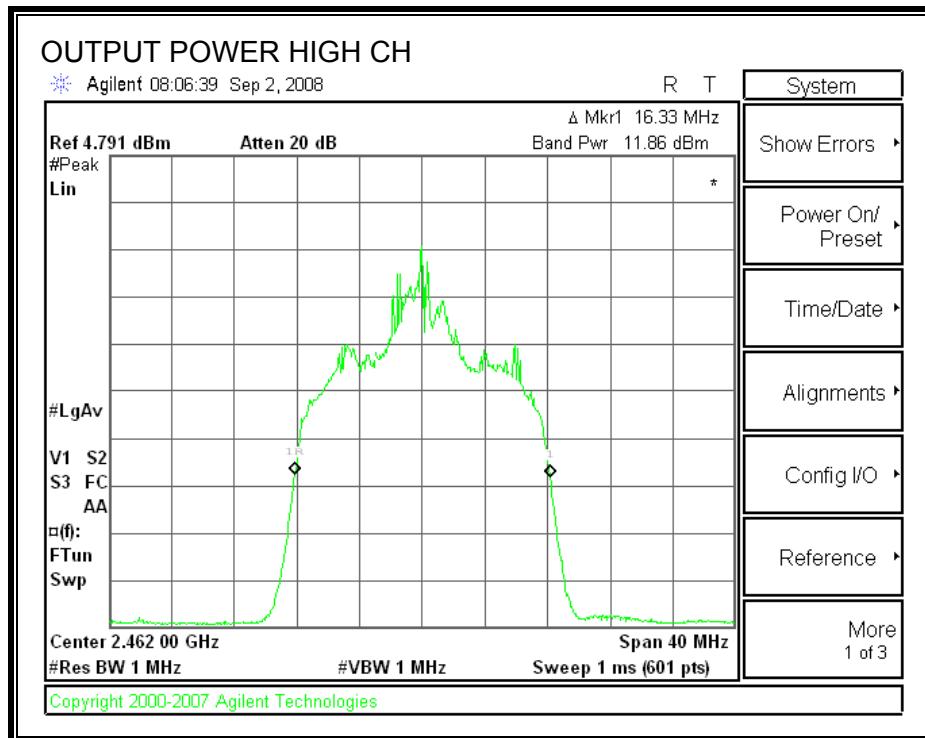
#### RESULTS

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	13.24	11	24.24	30	-5.76
Middle	2437	13.04	11	24.04	30	-5.96
High	2462	11.86	11	22.86	30	-7.14

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 11.5 dB (including 10 dB pad and .5dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	16.40
Middle	2437	16.50
High	2462	15.30

## 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.

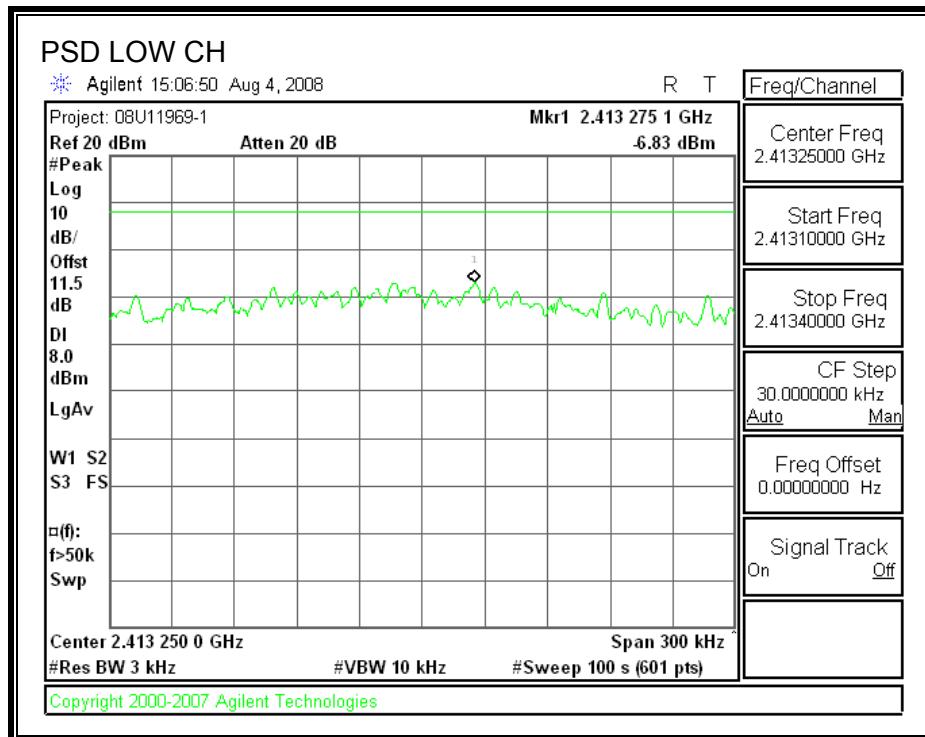
### TEST PROCEDURE

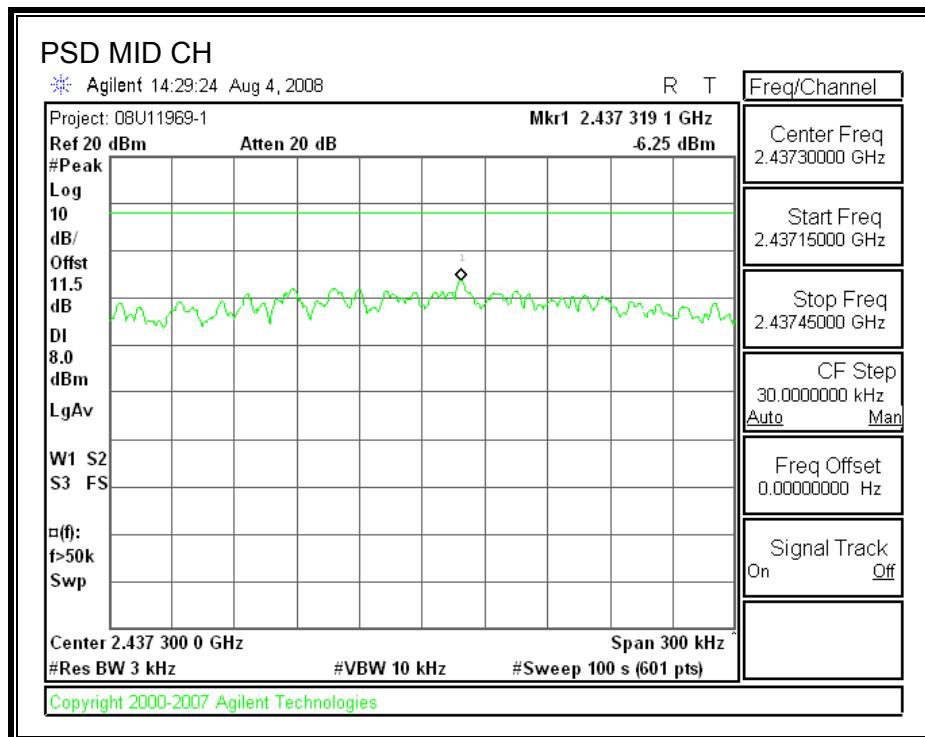
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

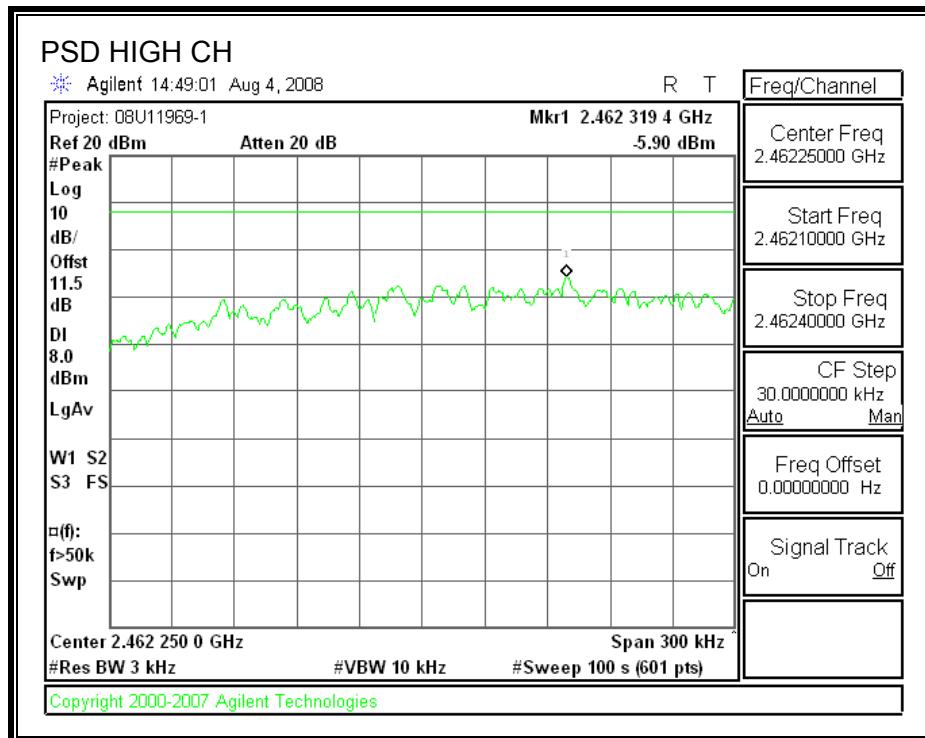
### RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-6.83	8	-14.83
Middle	2437	-6.25	8	-14.25
High	2462	-5.90	8	-13.90

**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.

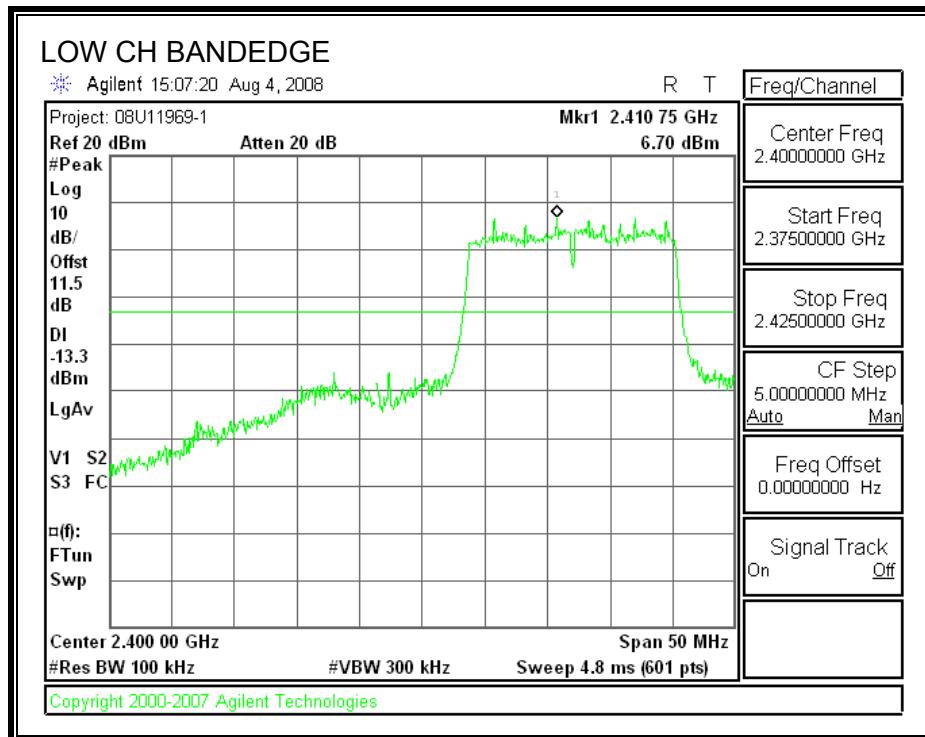
### TEST PROCEDURE

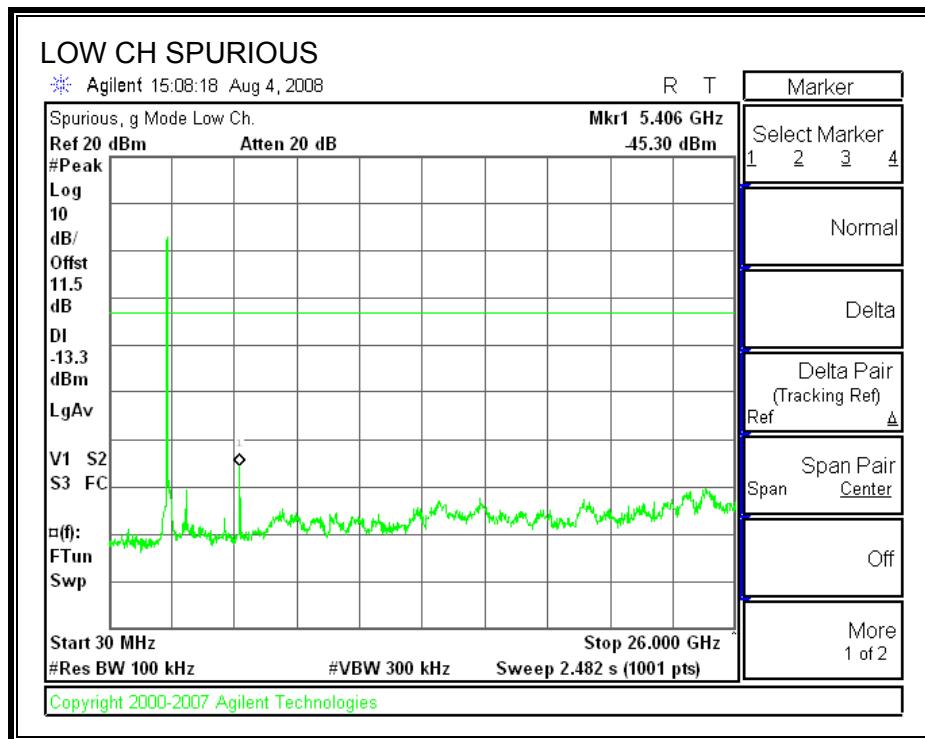
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

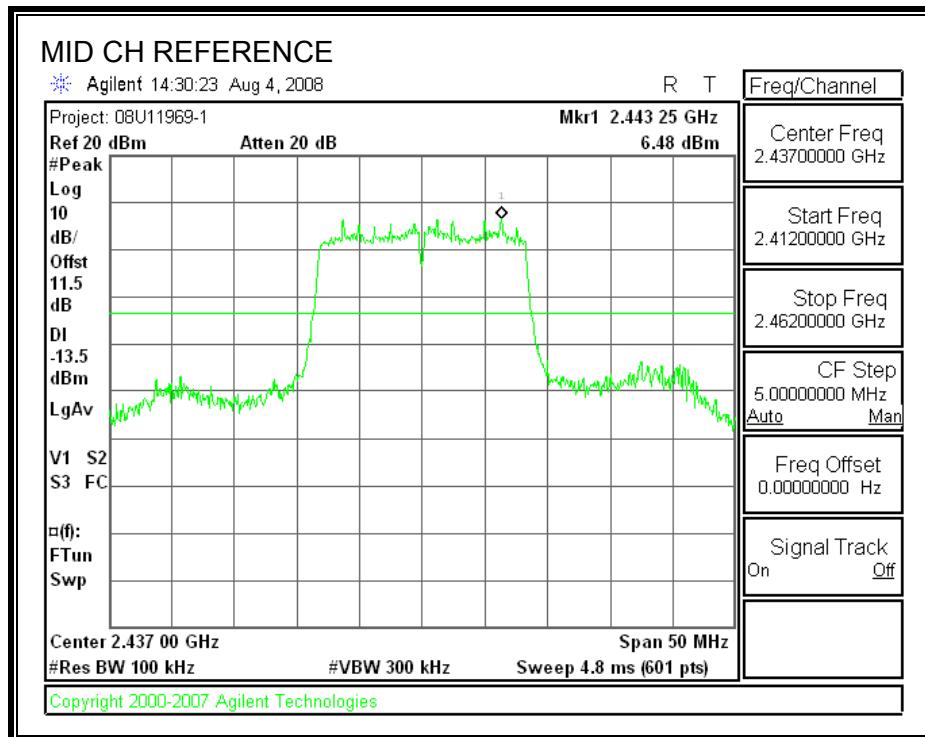
### RESULTS

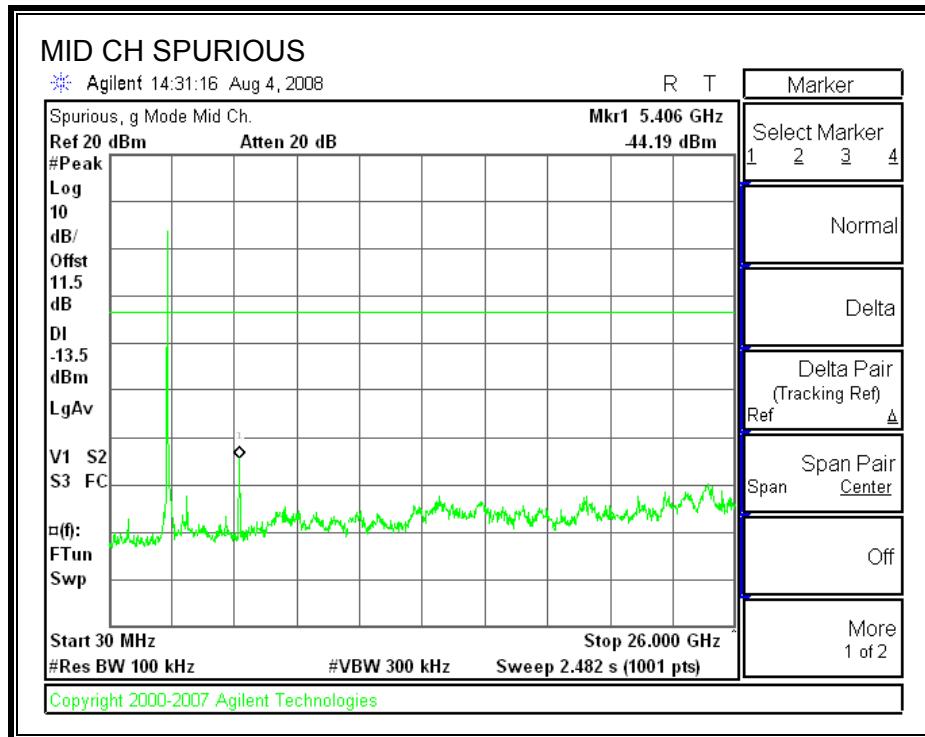
**SPURIOUS EMISSIONS, LOW CHANNEL**



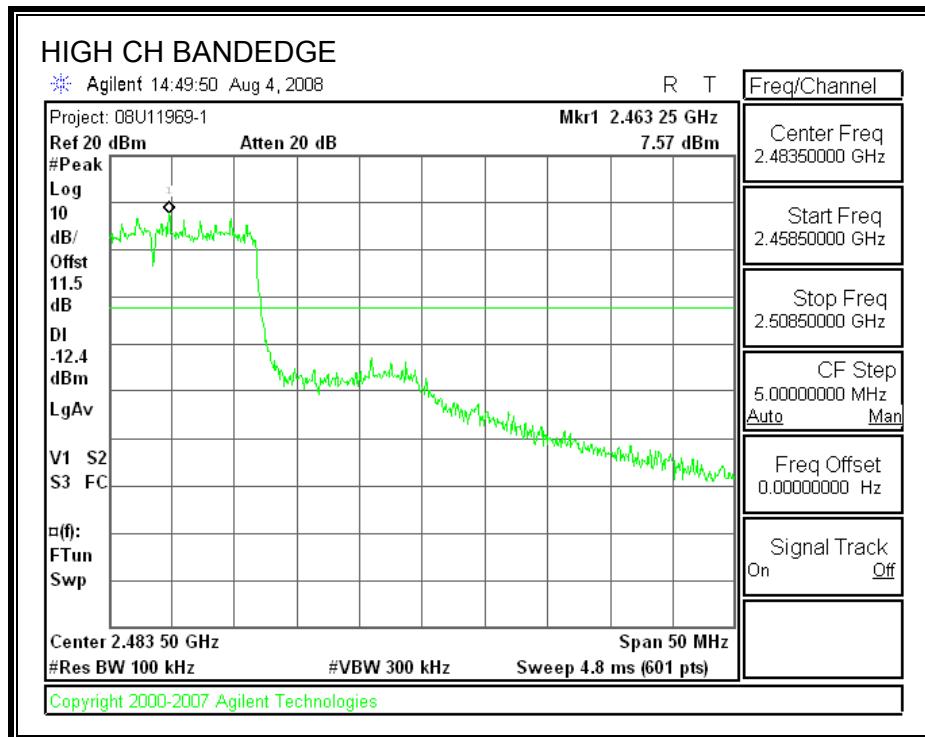


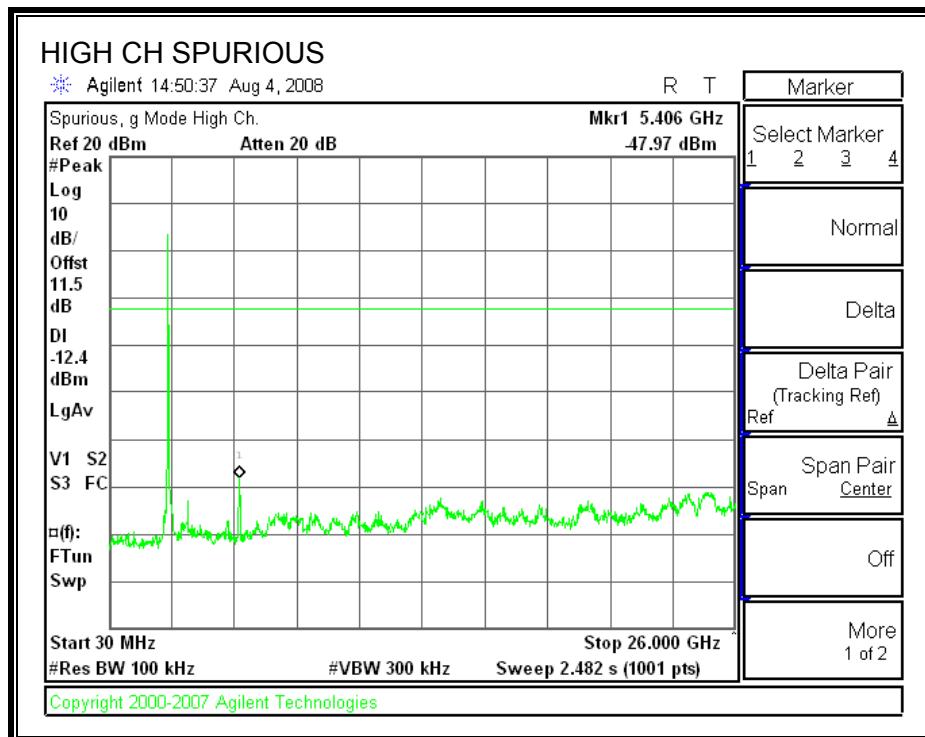
**SPURIOUS EMISSIONS, MID CHANNEL**





**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.

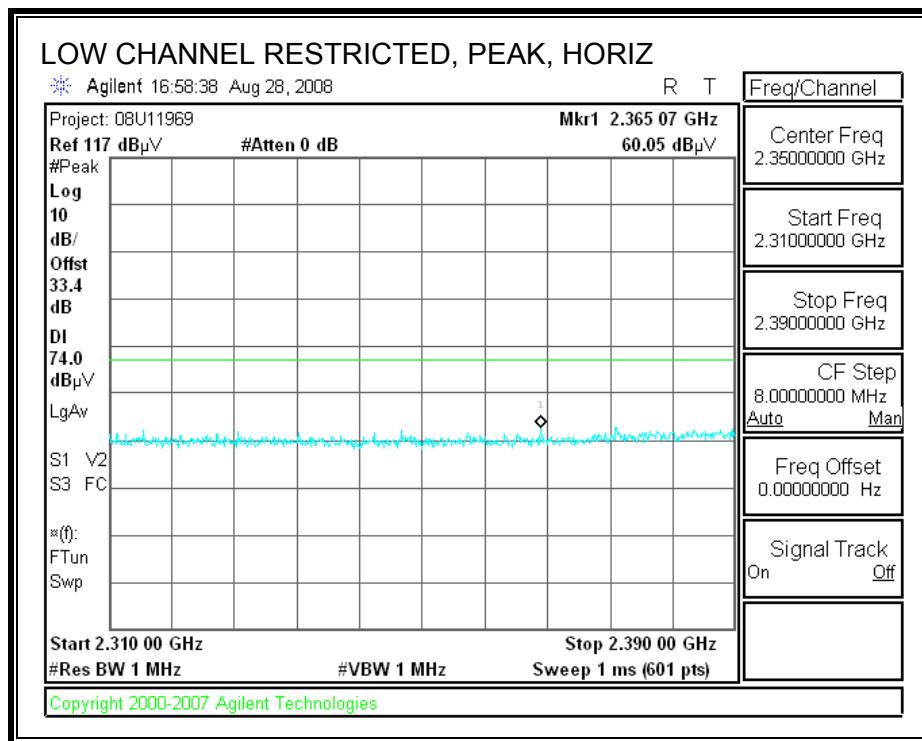
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

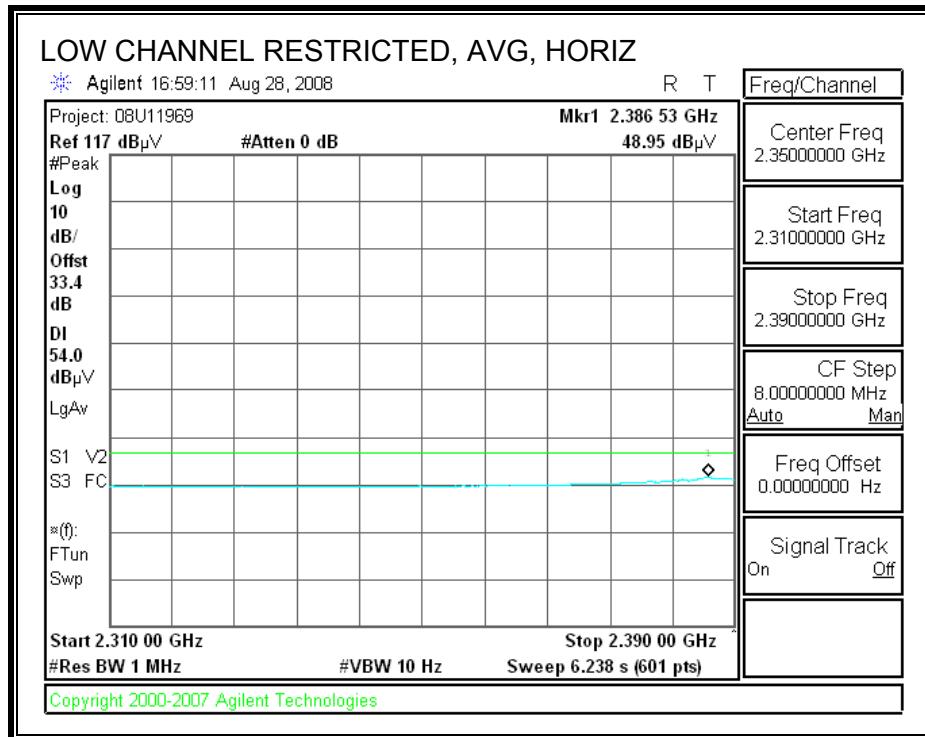
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

## 8.2. TRANSMITTER ABOVE 1 GHz

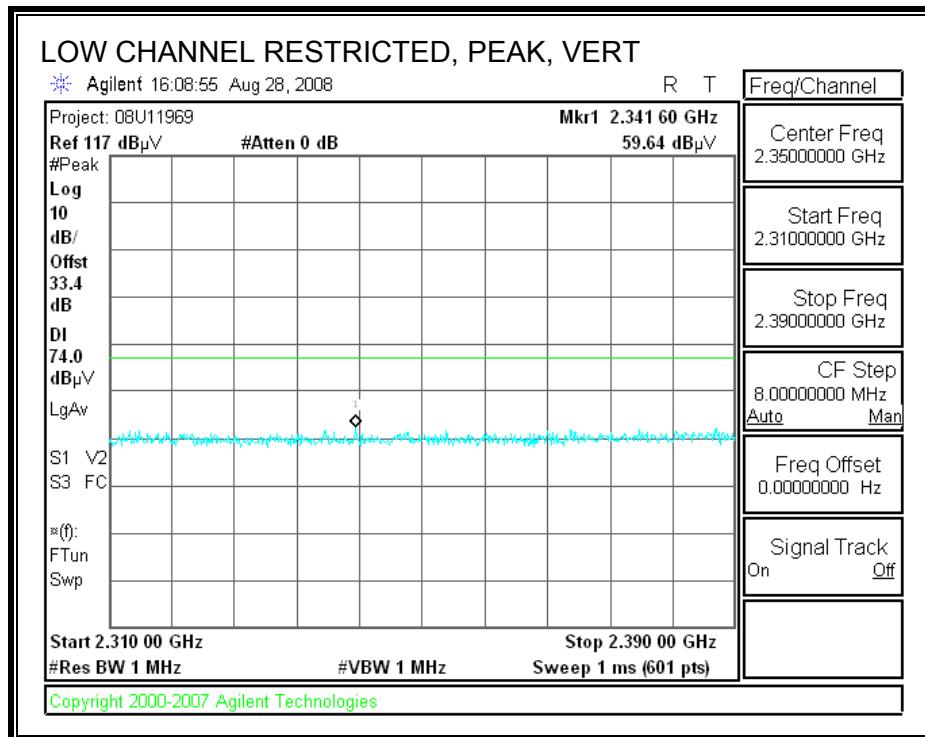
### 8.2.1. TRANSMITTER ABOVE 1 GHz FOR 802.11b MODE IN THE 2.4 GHz BAND

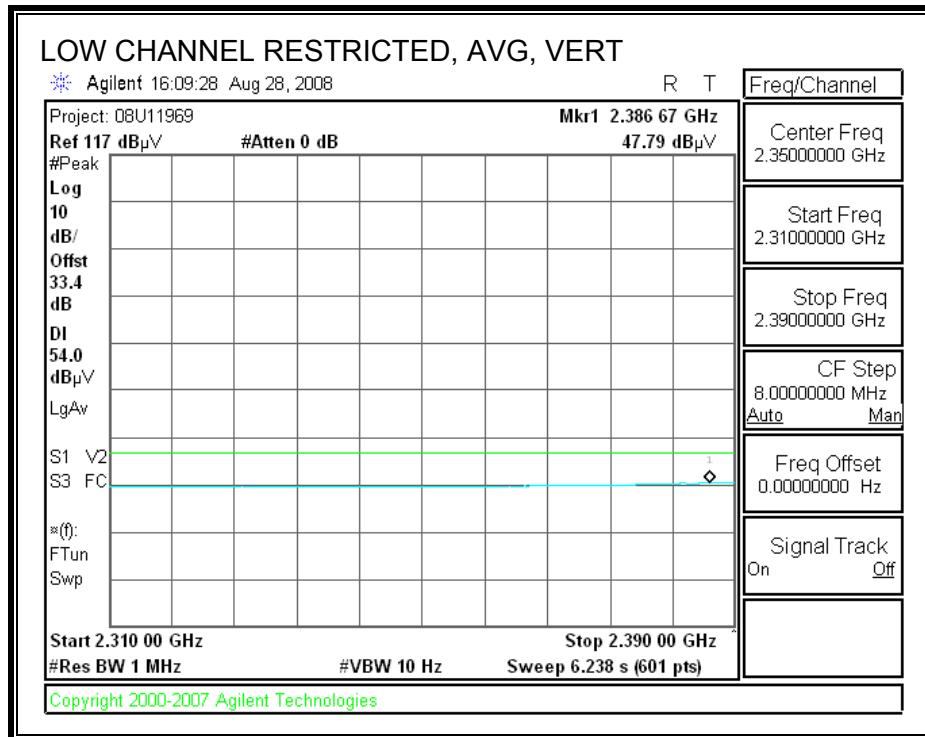
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



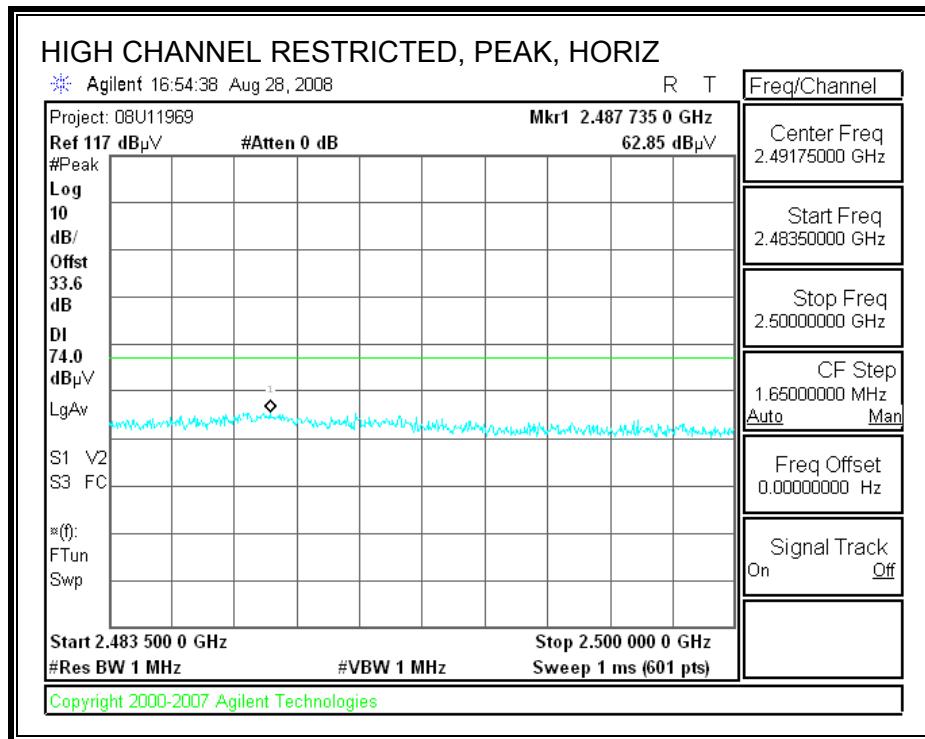


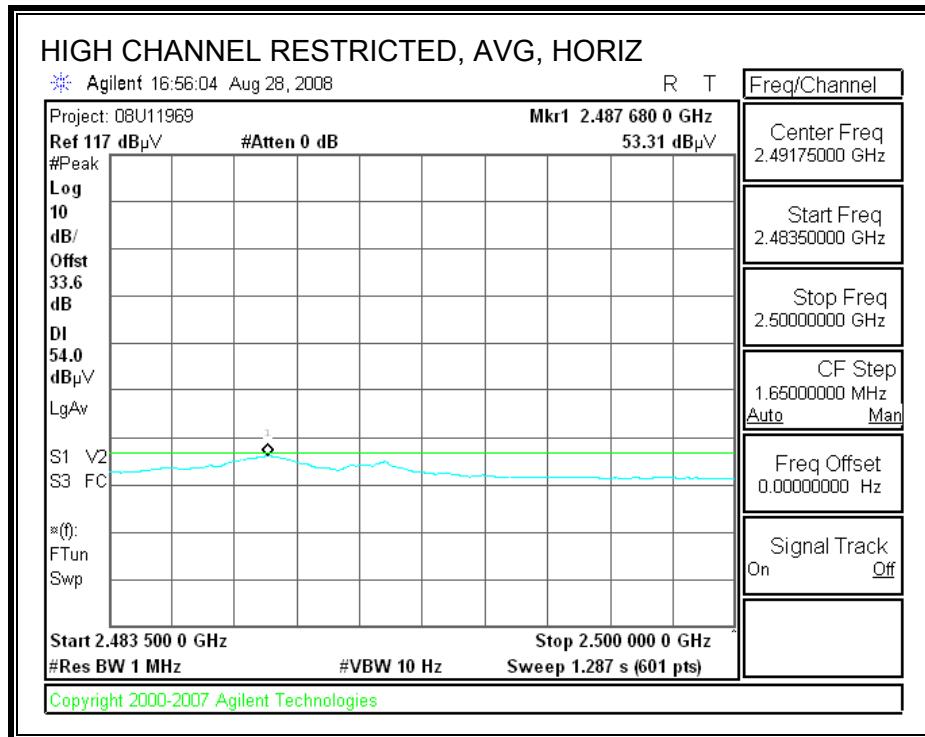
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



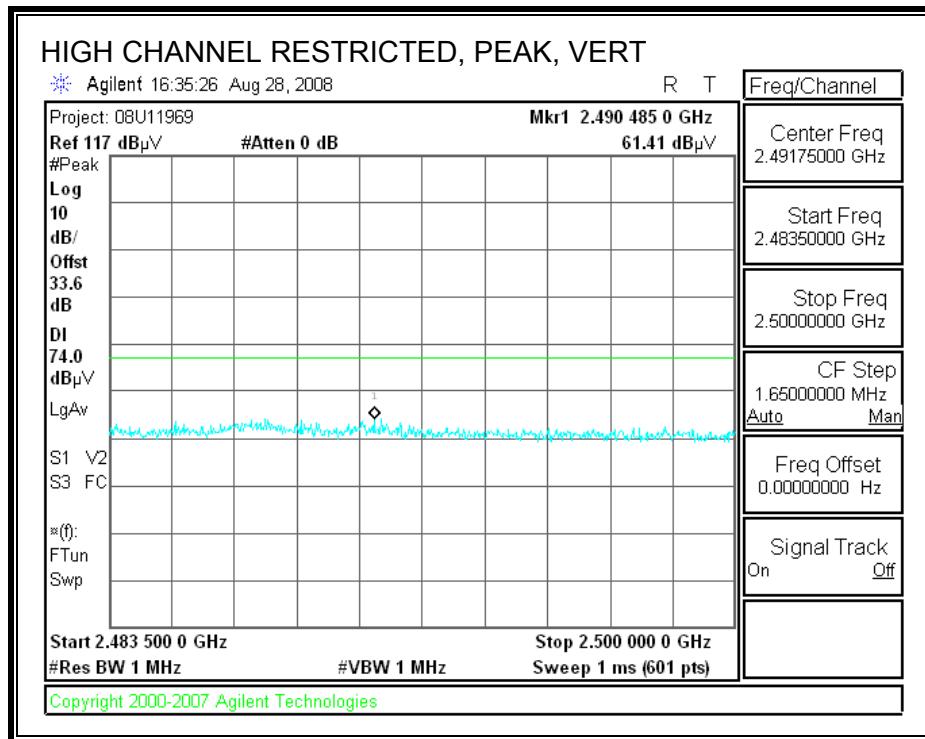


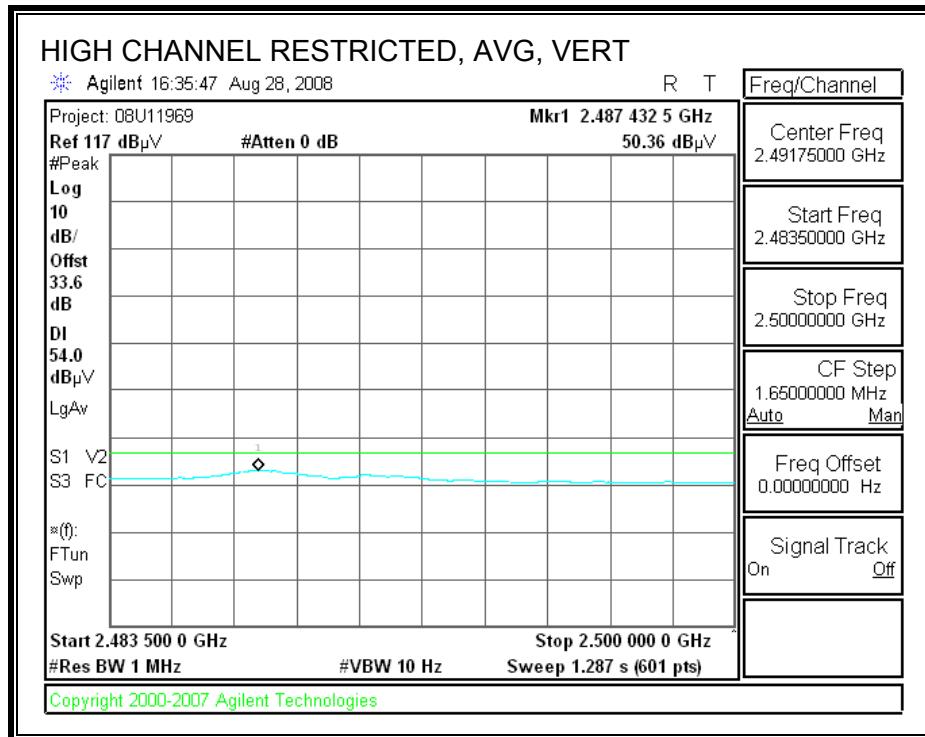
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





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



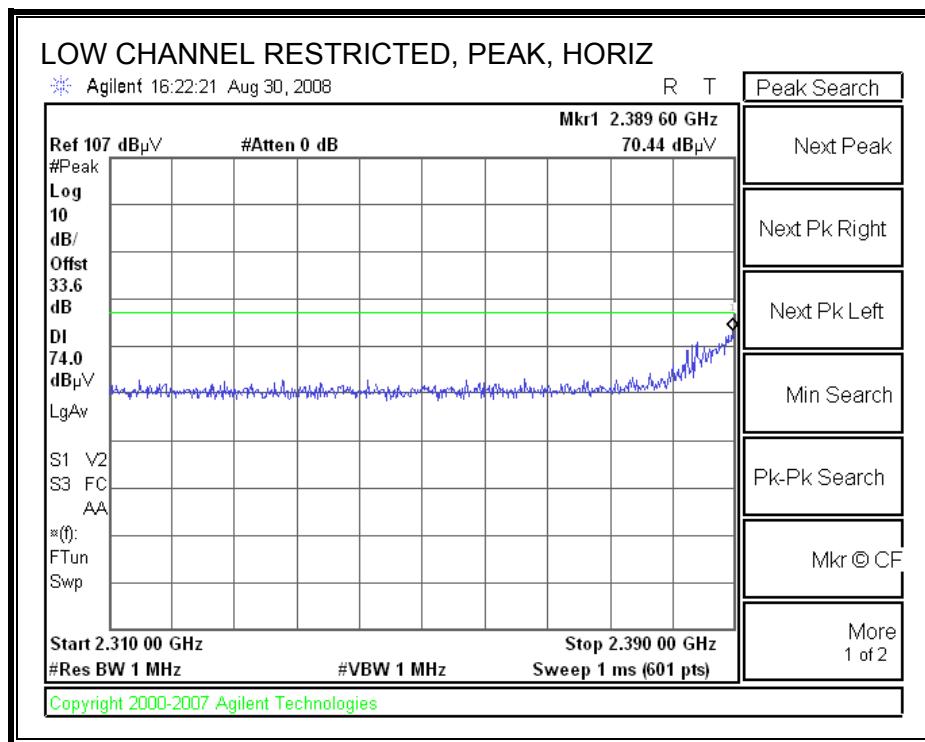


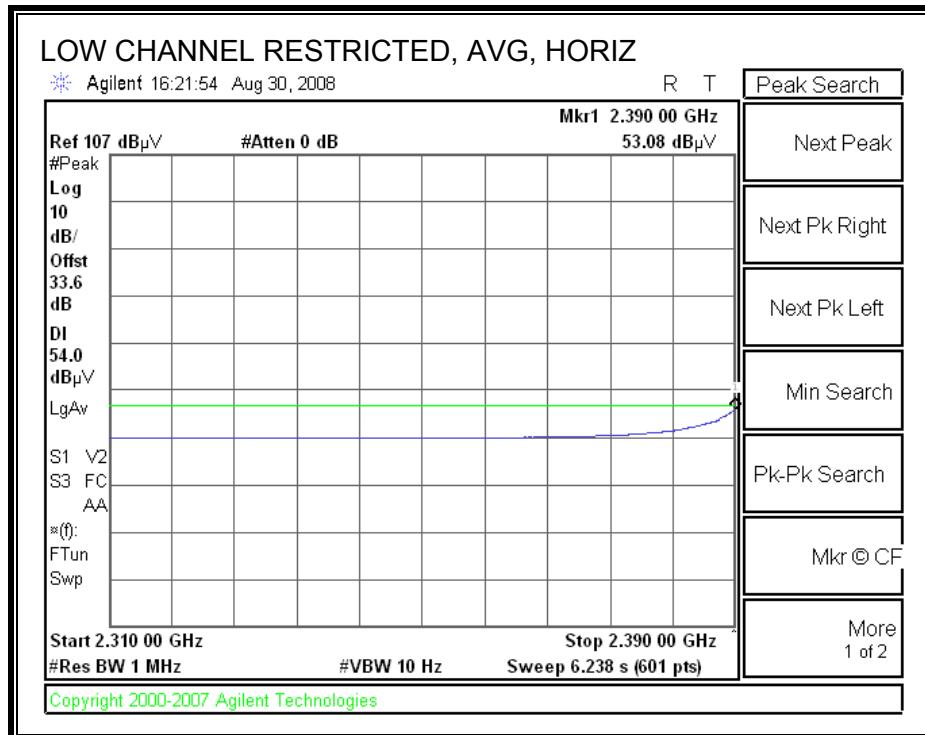
## HARMONICS AND SPURIOUS EMISSIONS

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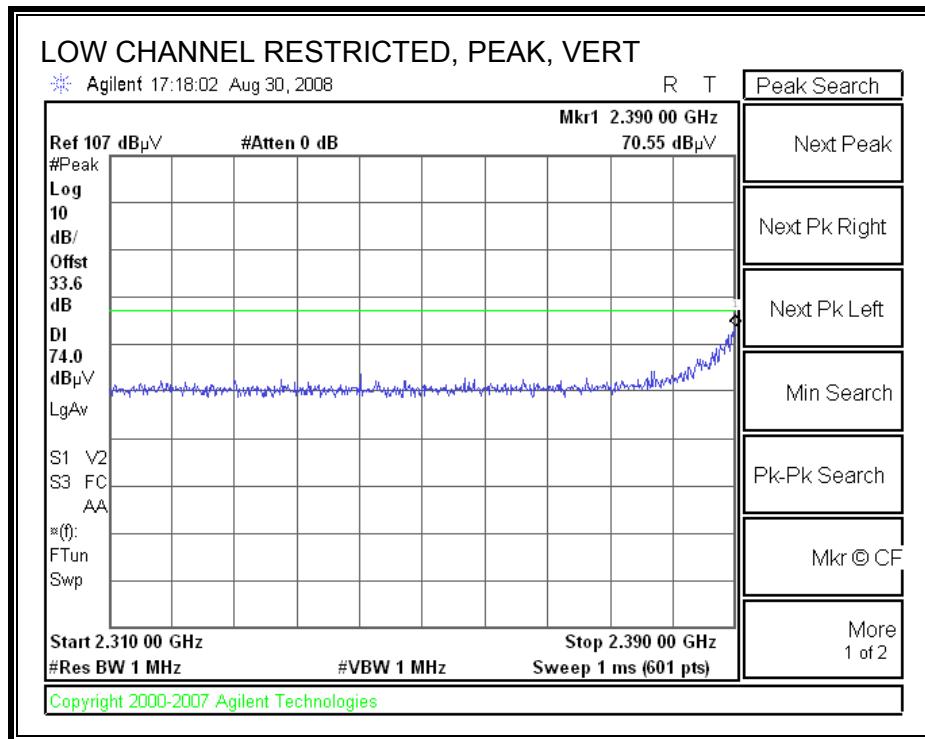
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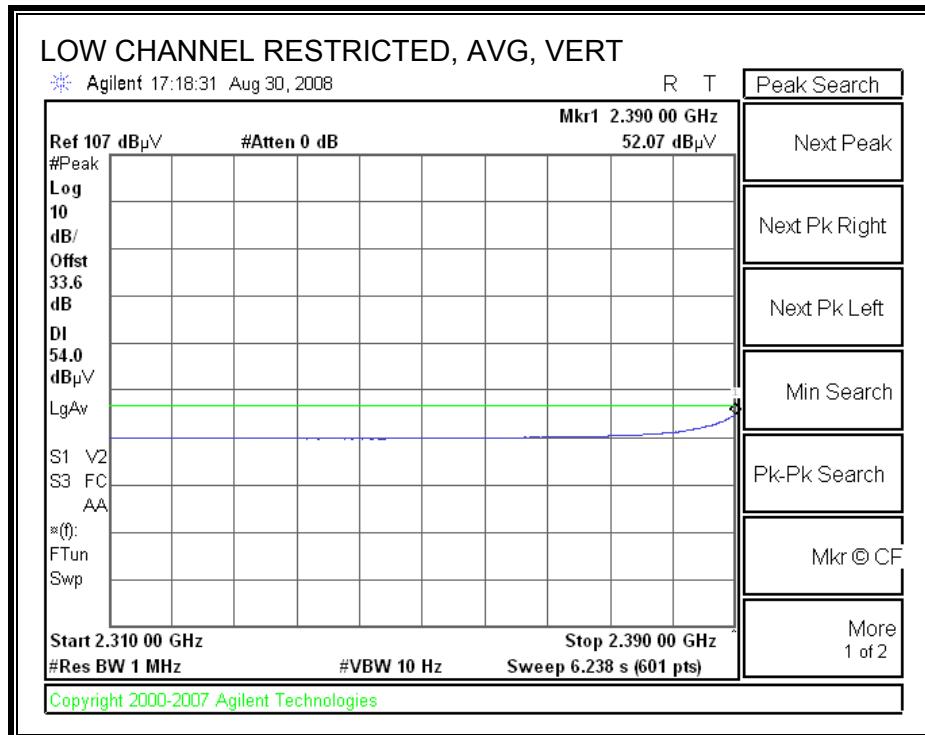
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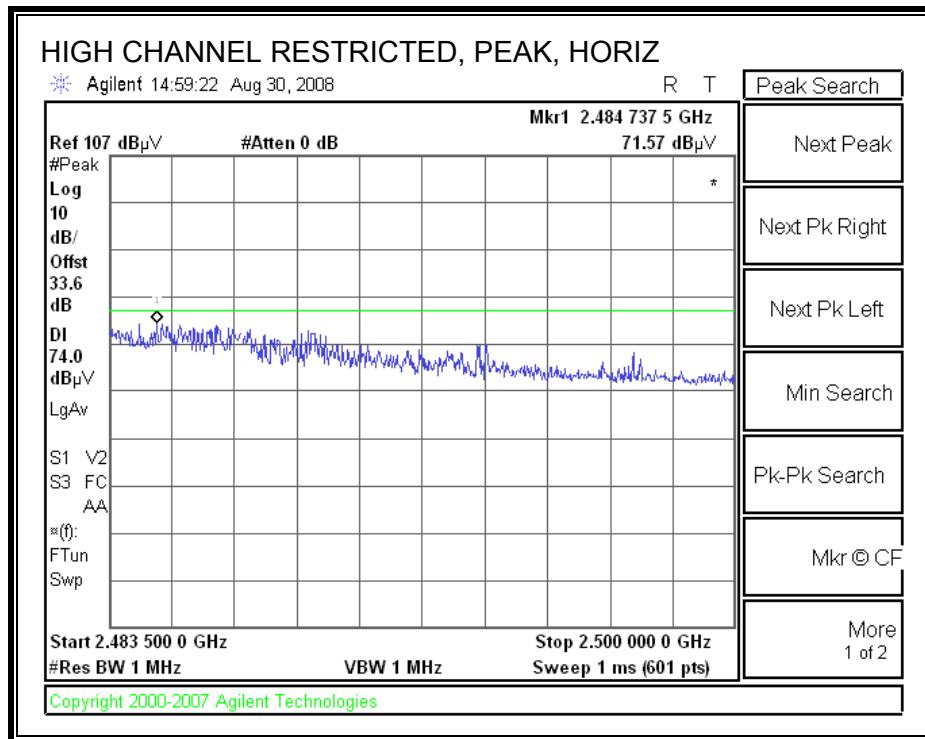


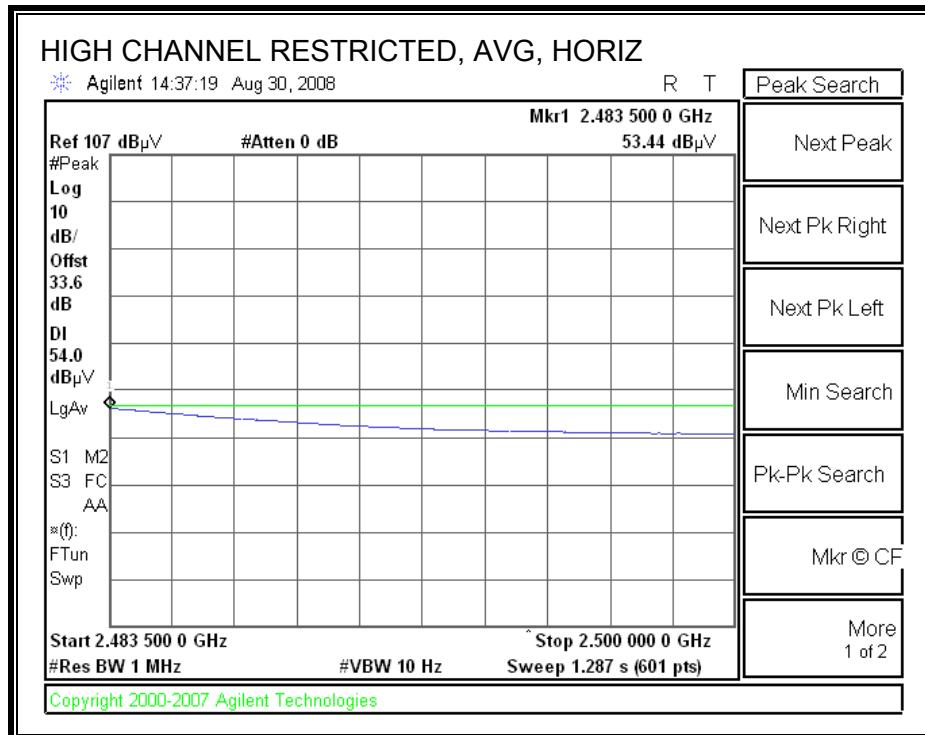
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



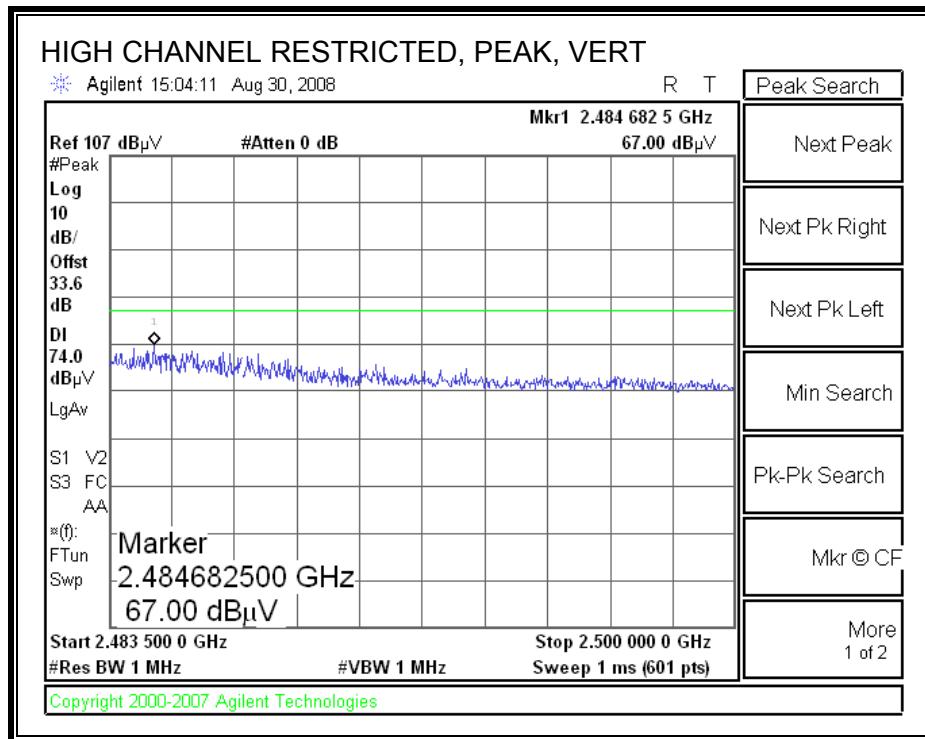


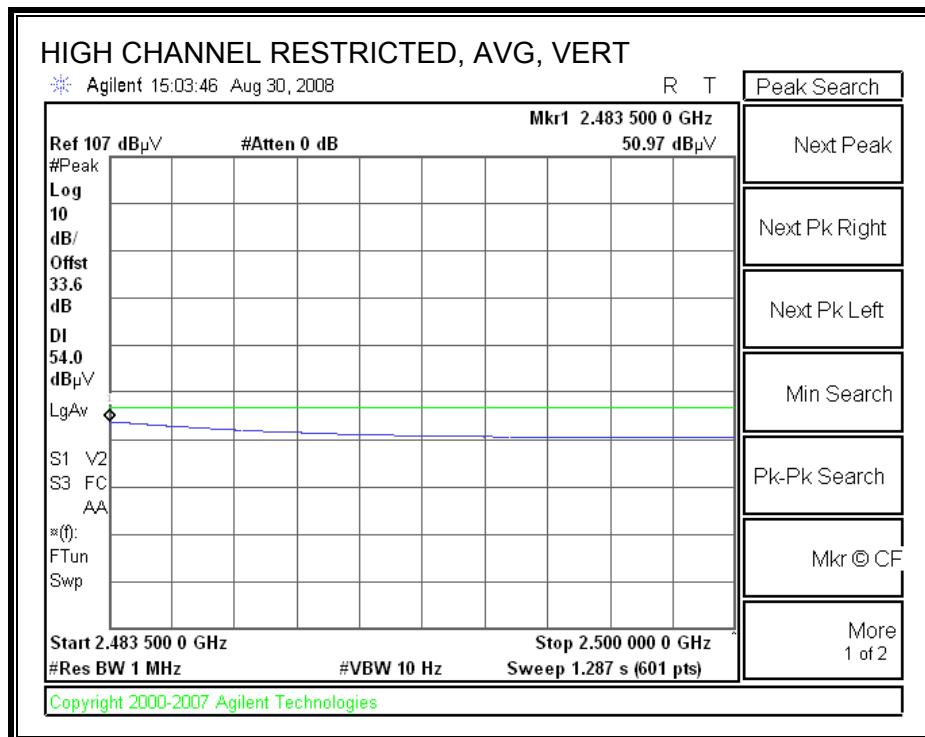
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





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**HARMONICS AND SPURIOUS EMISSIONS**

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### 8.3. RECEIVER ABOVE 1 GHz

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber																																																																																														
<p>Company: Apple Project #: 08U11969 Date: 8/28/2008 Test Engineer: Vien Tran Configuration: EUT, Test JIG &amp; Laptop Mode: Rx Mode</p> <p><b>Test Equipment:</b></p> <table border="1"> <tr> <td>Horn 1-18GHz</td> <td>Pre-amplifier 1-26GHz</td> <td>Pre-amplifier 26-40GHz</td> <td>Horn &gt; 18GHz</td> <td>Limit</td> </tr> <tr> <td>T73; S/N: 6717 @3m</td> <td>T144 Miteq 3008A00931</td> <td></td> <td></td> <td>FCC 15.209</td> </tr> </table> <p>Hi Frequency Cables</p> <table border="1"> <tr> <td>2 foot cable</td> <td>3 foot cable</td> <td>12 foot cable</td> <td>HPF</td> <td>Reject Filter</td> </tr> <tr> <td></td> <td></td> <td>B-5m Chamber</td> <td></td> <td></td> </tr> </table> <p><b>Peak Measurements</b> RBW=VBW=1MHz</p> <p><b>Average Measurements</b> RBW=1MHz, VBW=10Hz</p>															Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit	T73; S/N: 6717 @3m	T144 Miteq 3008A00931			FCC 15.209	2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter			B-5m Chamber																																																														
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## 8.4. WORST-CASE BELOW 1 GHz

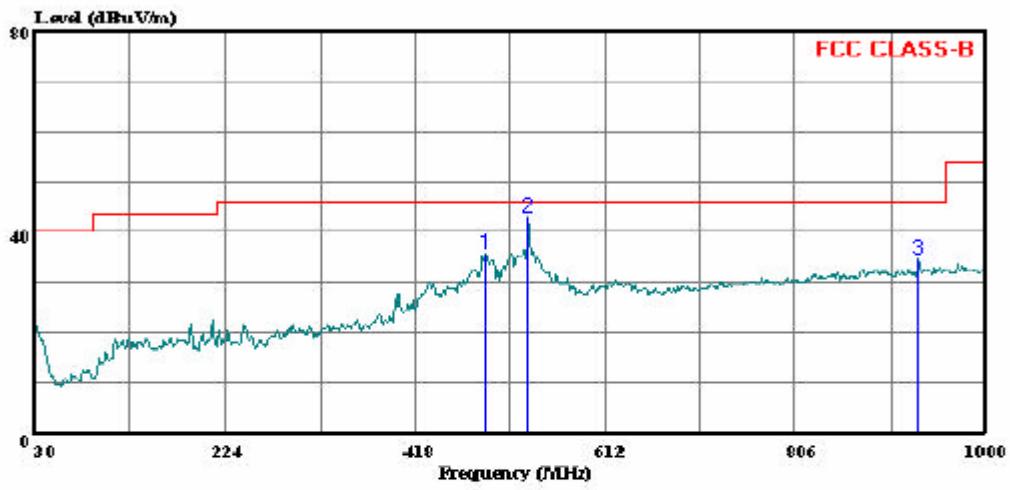
### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

#### HORIZONTAL PLOT & DATA



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

Data#: 13 File#: 08U11969.EMI Date: 08-22-2008 Time: 09:36:43



Trace: 12

Ref Trace:

Condition: FCC CLASS-B HORIZONTAL  
Test Operator:: Thanh Nguyen  
Project #: : 08U11969  
Company: : Apple Computer  
Configuration:: EUT with DC Power Supply  
Mode : : Transmit  
Target: : FCC Class B

Page: 1

Freq	Read			Limit Line	Over Limit	Remark
	Level	Factor	Level			
MHz	dBuV		dB	dBuV/m	dBuV/m	
1	489.780	40.81	-5.14	35.67	46.00	-10.33 Peak
2	533.430	47.09	-4.17	42.92	46.00	-3.08 Peak
3	931.130	31.63	2.92	34.55	46.00	-11.45 Peak

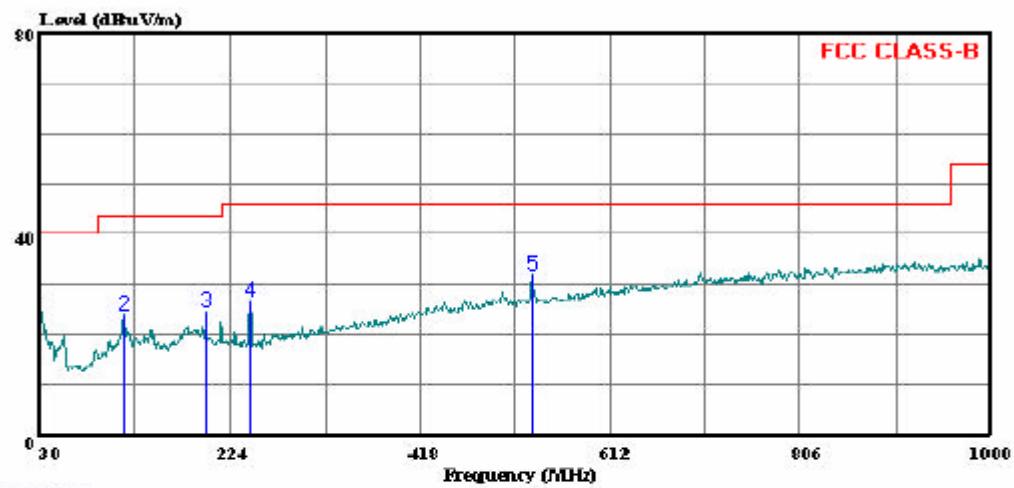
**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)**

**VERTICAL PLOT& DATA**



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

Data#: 2 File#: BT Below 1GHz.EMIDate: 08-22-2008 Time: 14:22:14



(Fremont)  
Trace: 1

Ref Trace:

Condition: FCC CLASS-B 3m ANTENNA B\_5M 021109 VERTICAL  
Test Operator:: Thanh Nguyen  
Project #: : 08U11969  
Company: : Apple Inc.  
Configuration:: EUT & Support Equipments  
Mode : : TX worst case  
Target: : FCC Class B

Page: 1

Freq	Read		Limit	Over	Remark
	Level	Factor			
MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1	30.000	33.33	-6.96	26.37	40.00 -13.63 Peak
2	115.360	37.00	-13.01	23.99	43.50 -19.51 Peak
3	199.750	36.83	-12.30	24.53	43.50 -18.97 Peak
4	244.370	39.50	-12.71	26.79	46.00 -19.21 Peak
5	532.460	35.67	-3.91	31.76	46.00 -14.24 Peak