



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

**FOR  
802.11n 1X2 PCIe MINICARD TRANSCEIVER  
MODEL NUMBER: AR5B91  
FCC ID: PPD-AR5B91  
IC: 4104A-AR5B91**

**REPORT NUMBER: 08U11615-1  
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**NVLAP LAB CODE 200065-0**

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** ATHEROS COMMUNICATION, INC  
5480 GREAT AMERICA PARKWAY  
SANTA CLARA, CA 95054 USA

**EUT DESCRIPTION:** 802.11n 1X2 PCIe MINICARD TRANSCEIVER

**MODEL:** AR5B91

**SERIAL NUMBER:** HB91-150-S0423 AND XB91-150-S0412

**DATE TESTED:** FEBRUARY 08-16, 2008

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	No Non-Compliance Noted
RSS-210 Issue 7 Annex 8 and RSS-GEN Issue 2	No Non-Compliance Noted

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. 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 Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services 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:



THU CHAN  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

Tested By:



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.

## 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 802.11n 1x2 PCIe Minicard transceiver, model AR5B91, with both full length and half length boards.

The radio module is manufactured by Atheros Communications, 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	22.78	189.67
2412 - 2462	802.11g	25.97	395.37
2412 - 2462	802.11n HT20	25.25	334.97
2422 - 2452	802.11n HT40	26.06	403.65

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna, with a maximum gain of 3.62 dBi.

### 5.4. SOFTWARE AND FIRMWARE

The test utility and driver software used during testing was Art ANWI 1.4 and Devlib Revision 0.6 Build #18 Art\_11n.

## **5.5. WORST-CASE CONFIGURATION AND MODE**

Both half length and full length boards were evaluated on conducted and radiated emissions tests to find the worst case.

The worst-case data rate for each mode is determined to be as follows, based on preliminary tests of the chipset utilized in this 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.

All final tests in the 802.11n HT20 mode were made at MCS1.

All final tests in the 802.11n HT40 mode were made at MCS0.

For RF conducted emissions, all tests were performed on half length board.

For RF radiated emissions, all tests were performed on both half and full length boards.

For radiated emissions above 1GHz, horn antenna at vertical polarization is determined to be the worst case during baseline scan on b-mode, therefore only vertical position is investigated on harmonic spurious on g mode, HT20 and HT40 mode.

For radiated emissions below 1 GHz the worst-case configuration is determined to be the b-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	IBM	ThinkPad T42	ZZ-27001	DoC
AC Adapter	IBM	92P1016	11S92P1016Z1ZAC66AJ135	DoC

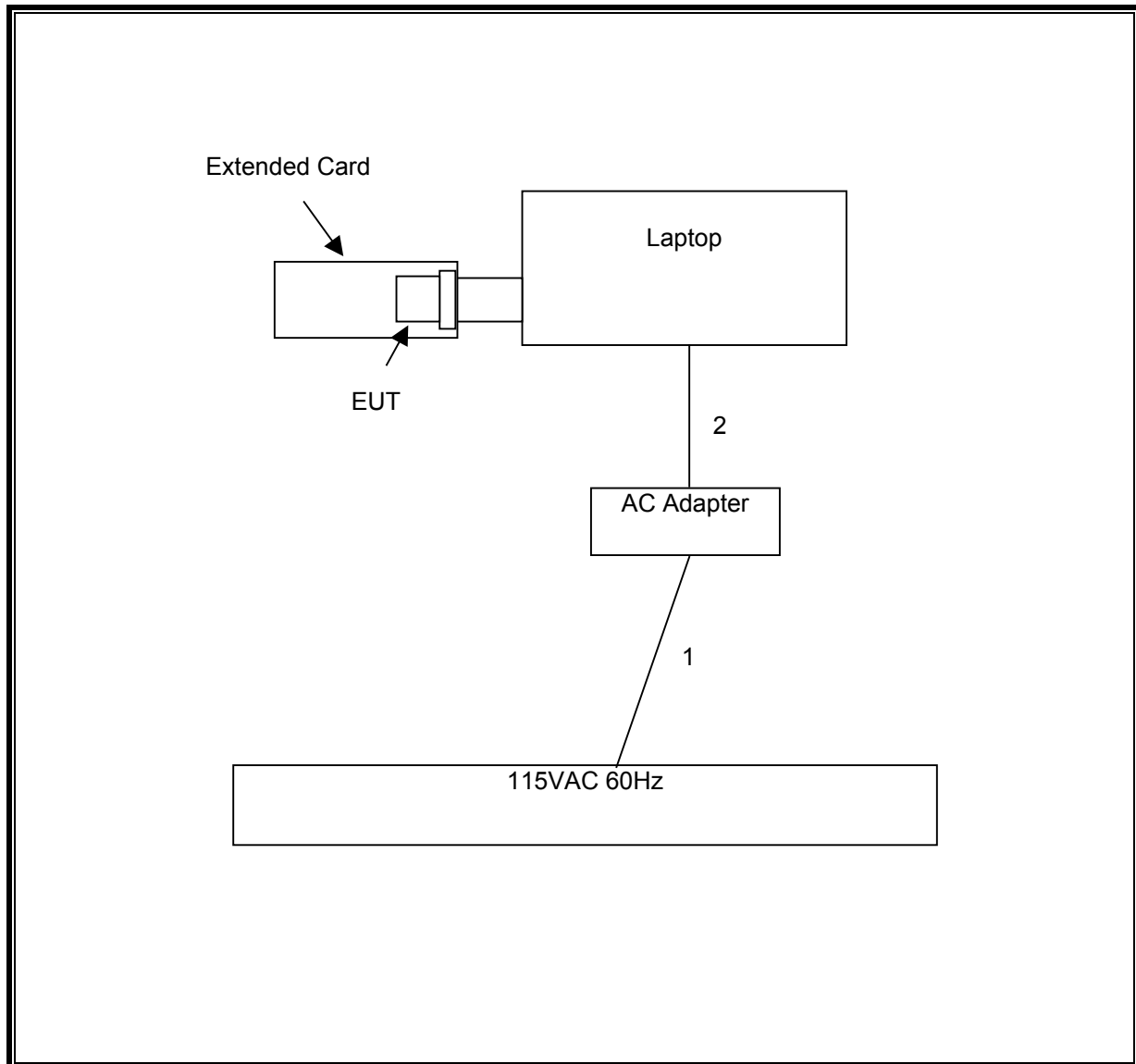
### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Un-shielded	2m	One Ferrite at Laptop End
2	DC	1	DC	Un-shielded	2m	N/A

### TEST SETUP

The EUT is installed in a host laptop computer via an extended card during 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
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	12/3/2007	3/3/2009
Peak Power Meter	Agilent / HP	E4416A	C00963	12/4/2007	12/4/2009
Peak / Average Power Sensor	Agilent	E9327A	C00964	12/7/2007	12/7/2009
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	9/28/2007	9/28/2008
Antenna, Horn, 18 GHz	EMCO	3115	C00945	4/15/2007	4/15/2008
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	9/27/2007	9/27/2008
EMI Receiver, 2.9 GHz	Agilent / HP	8542E	C00957	2/6/2007	6/12/2008
RF Filter Section, 2.9 GHz	Agilent / HP	85420E	C00958	2/6/2007	6/12/2008
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	2/6/2008	8/6/2009
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/25/2007	10/25/2008
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	8/3/2007	9/27/2008
2.4-2.5GHz Reject Filter	Micro Tronics	BRM50702	N02685	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)

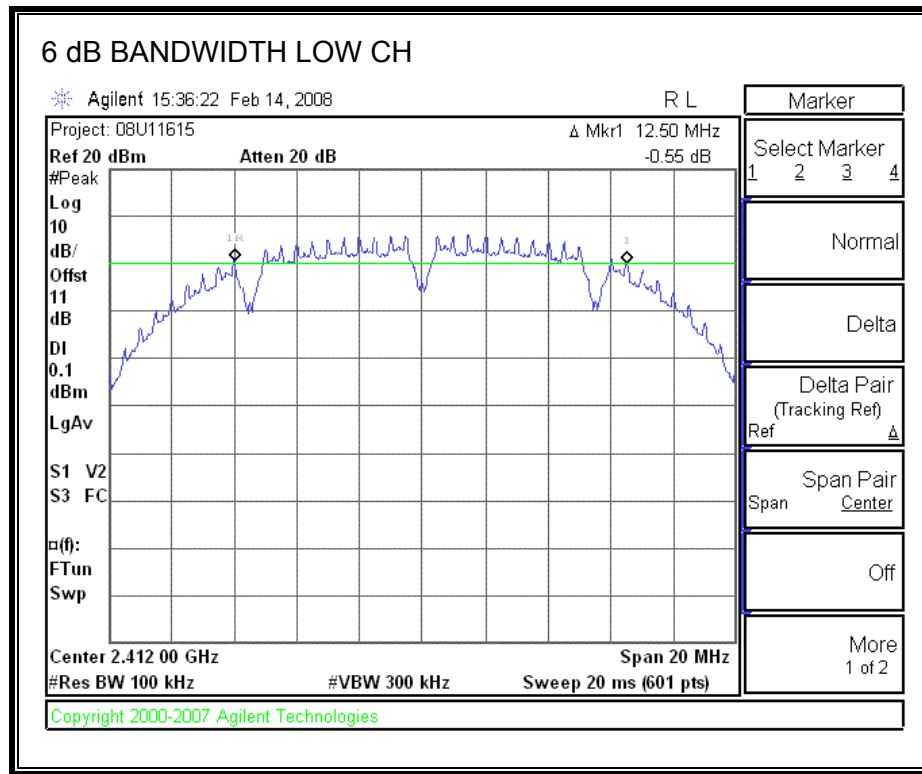
The minimum 6 dB bandwidth shall be at least 500 kHz.

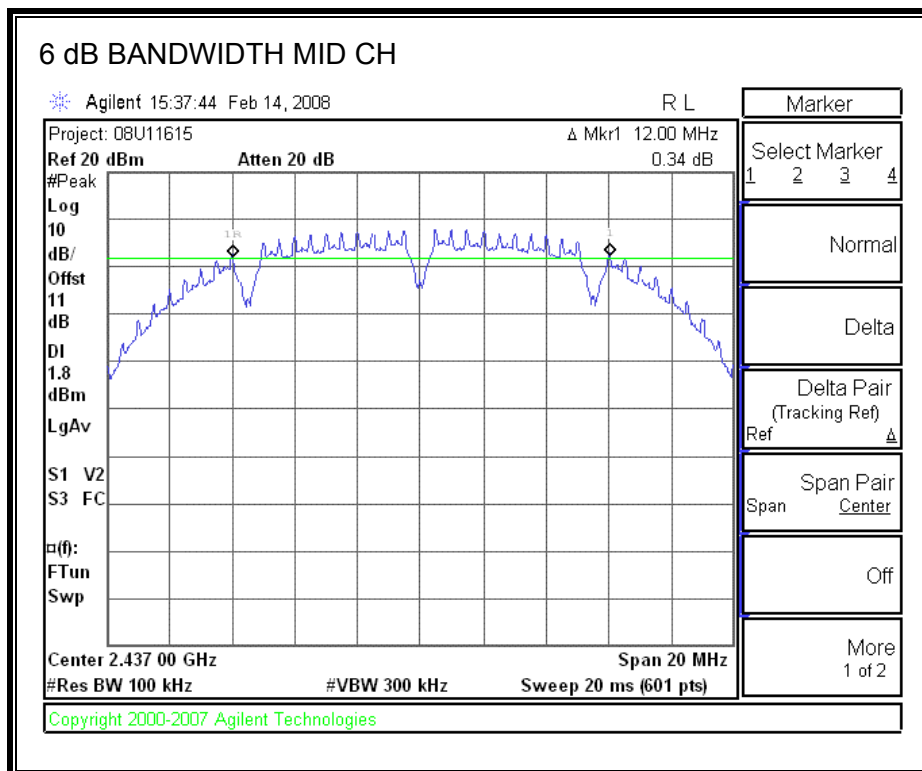
##### TEST PROCEDURE

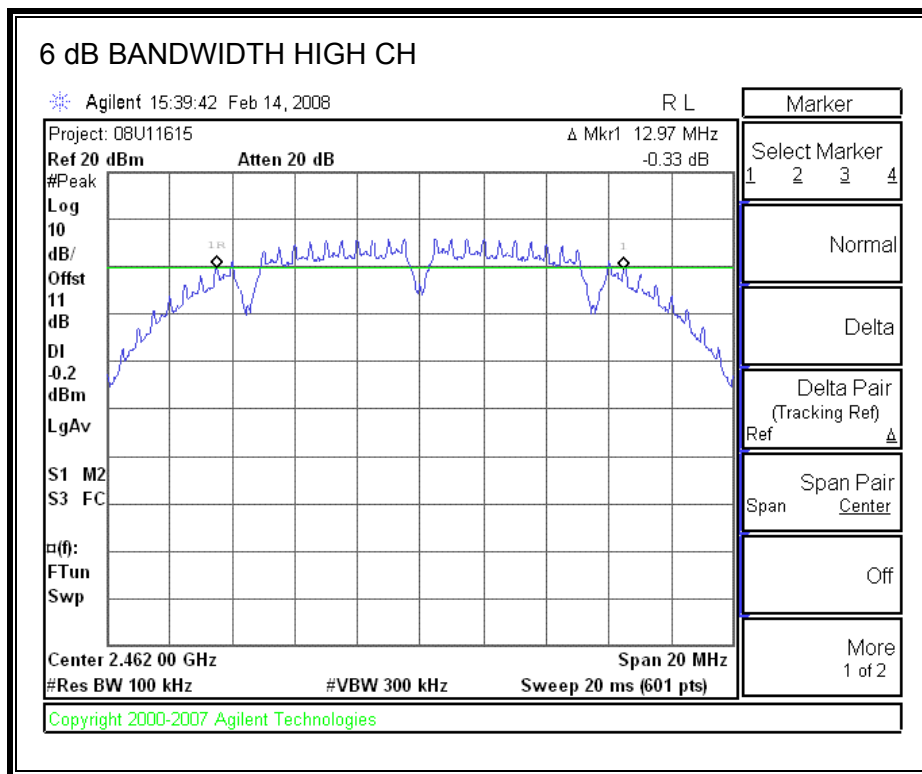
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

##### RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	12.50	0.5
Middle	2437	12.00	0.5
High	2462	12.97	0.5







### 7.1.2. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

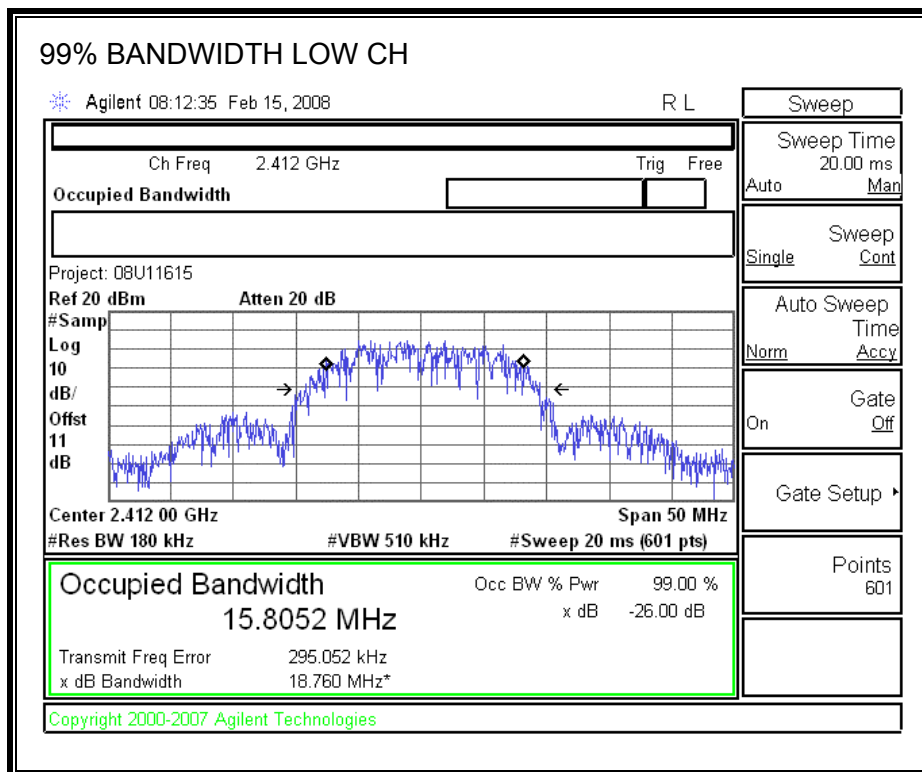
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

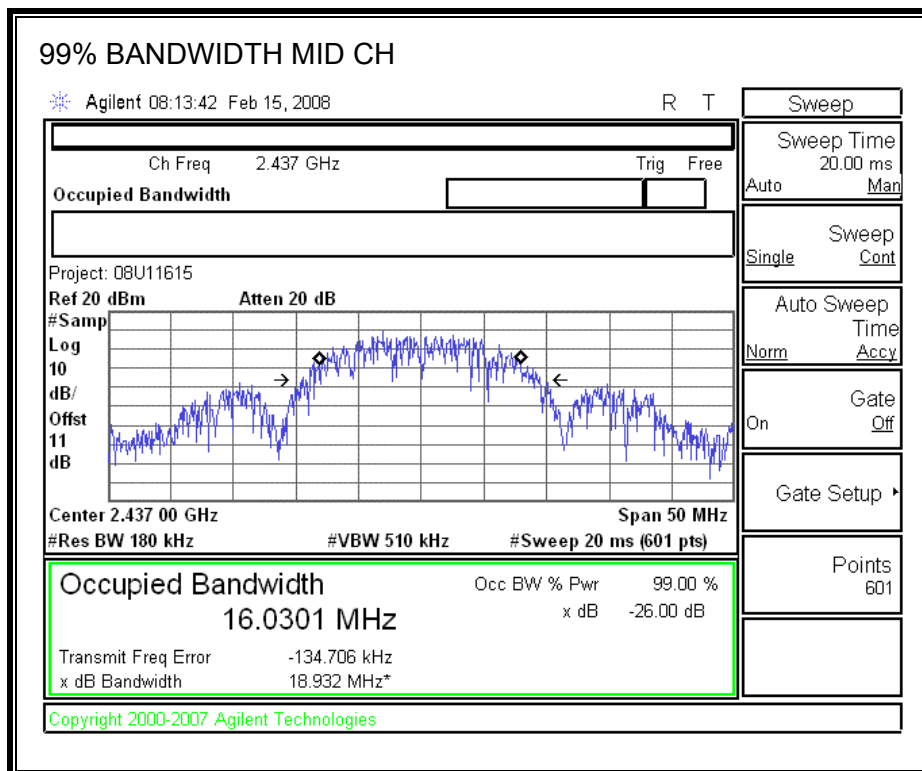
#### RESULTS

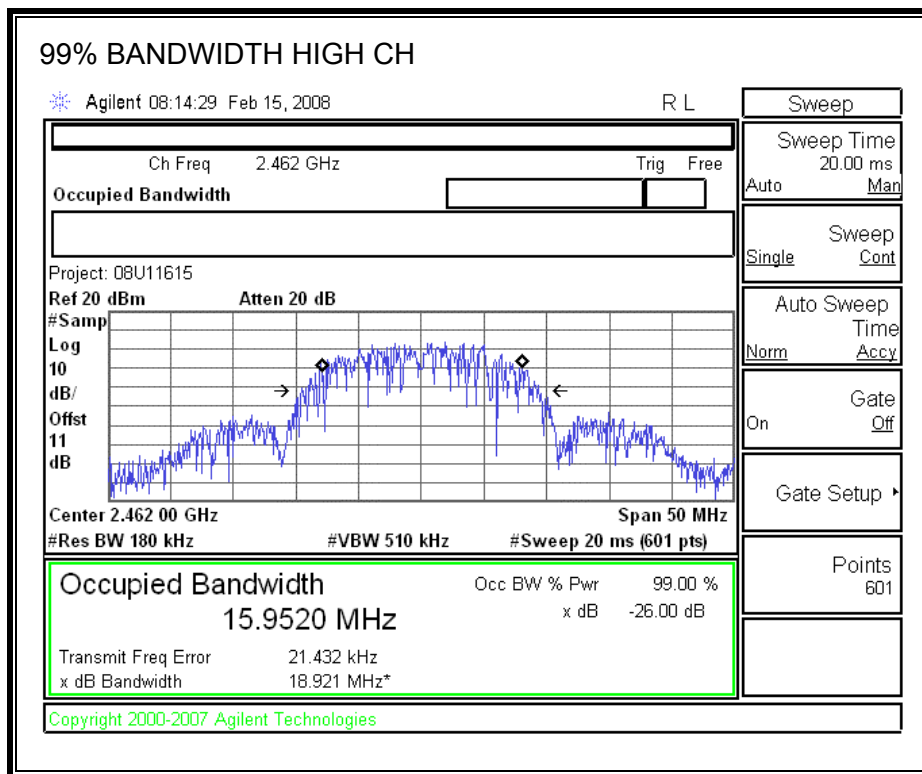
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	15.8052
Middle	2437	16.0301
High	2462	15.9520



**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.

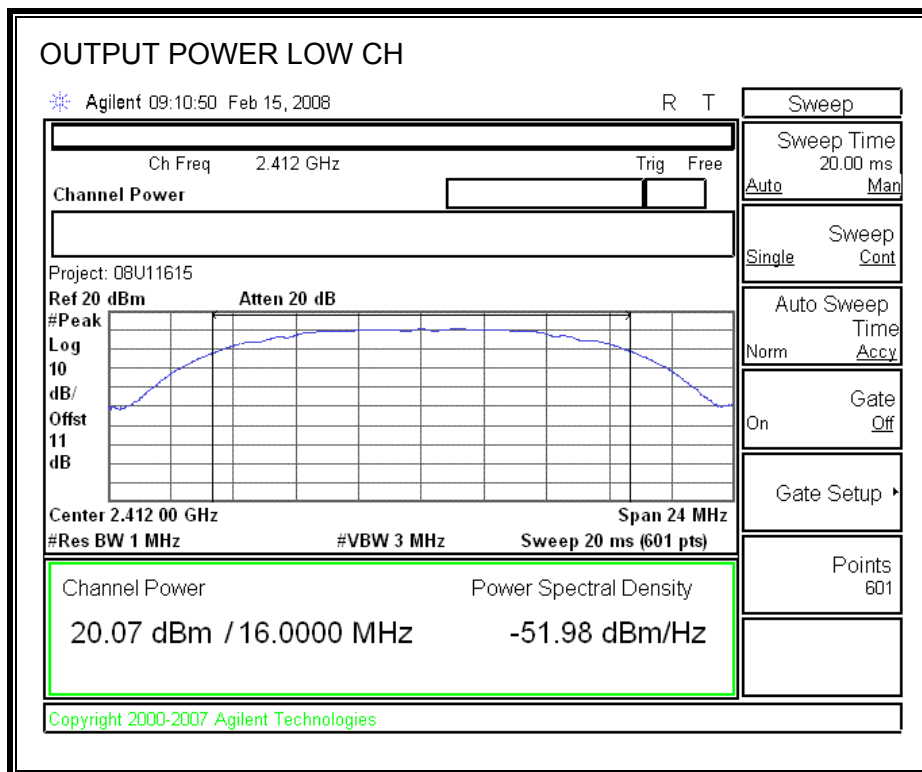
#### TEST PROCEDURE

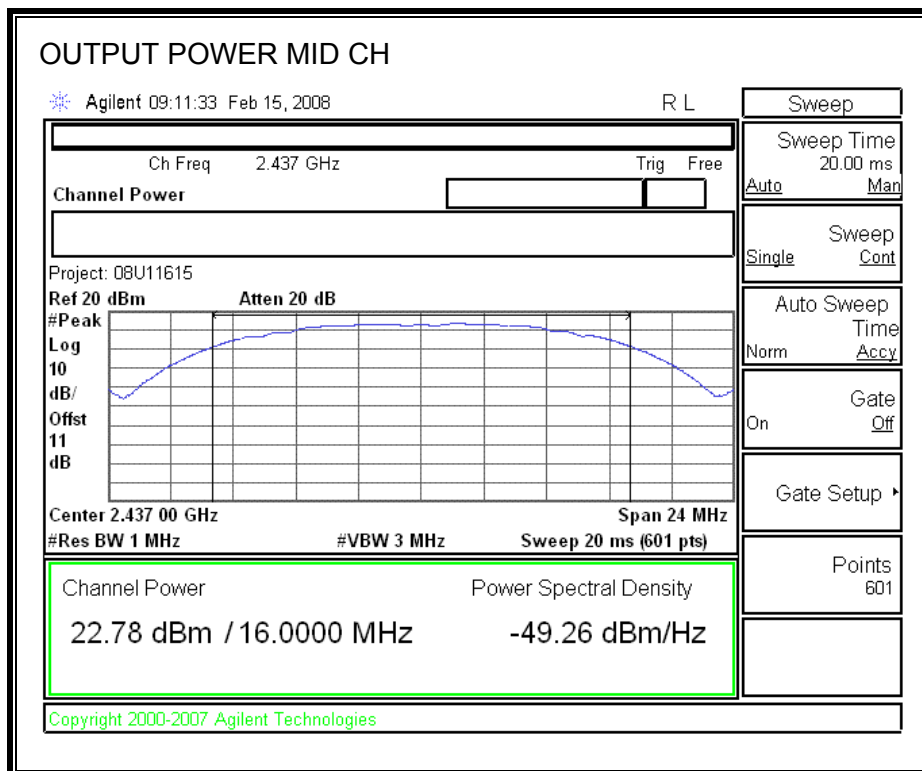
Peak power is measured using the spectrum analyzer's internal channel power integration function. Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.

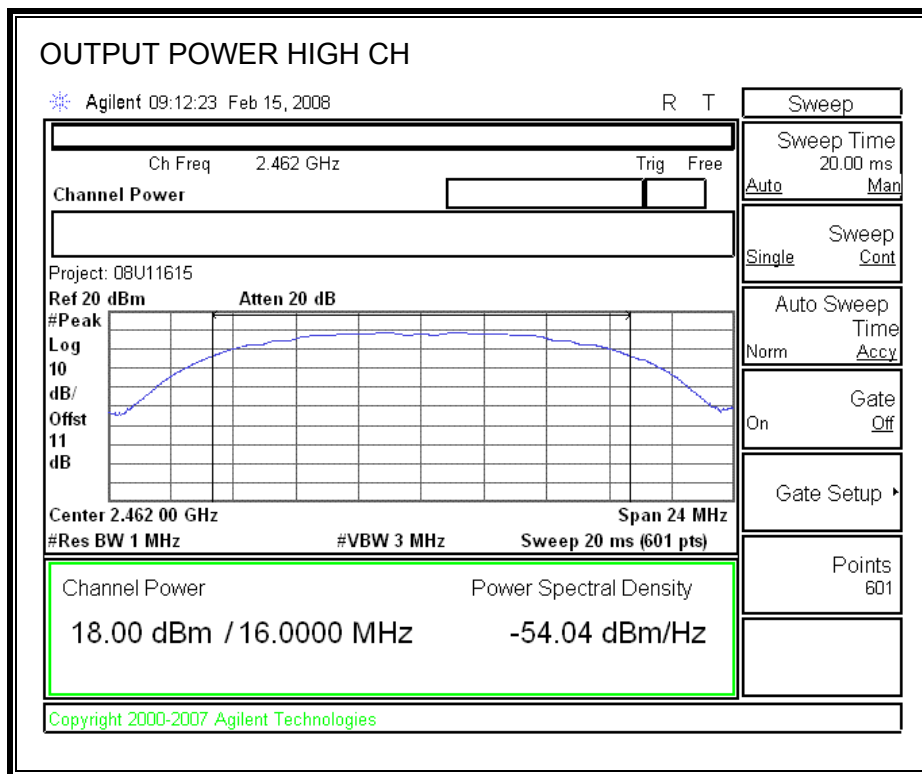
#### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	20.07	30	-9.93
Middle	2437	22.78	30	-7.22
High	2462	18.00	30	-12.00

## 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 dB (including 10 dB pad and 1dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	17.00
Middle	2437	19.50
High	2462	15.10



## 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.

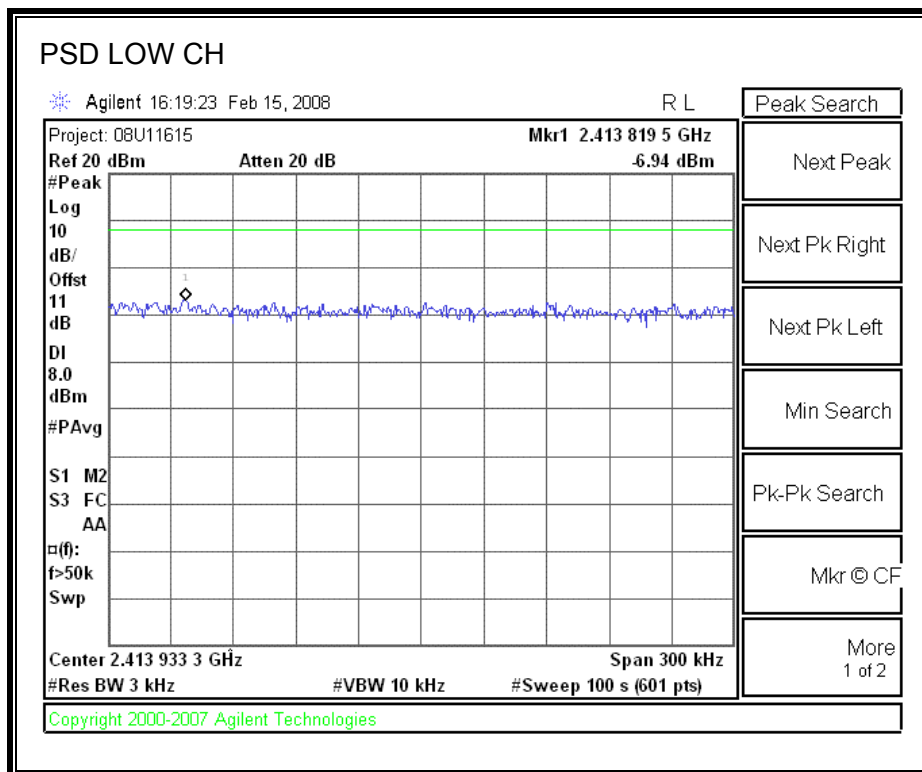
### TEST PROCEDURE

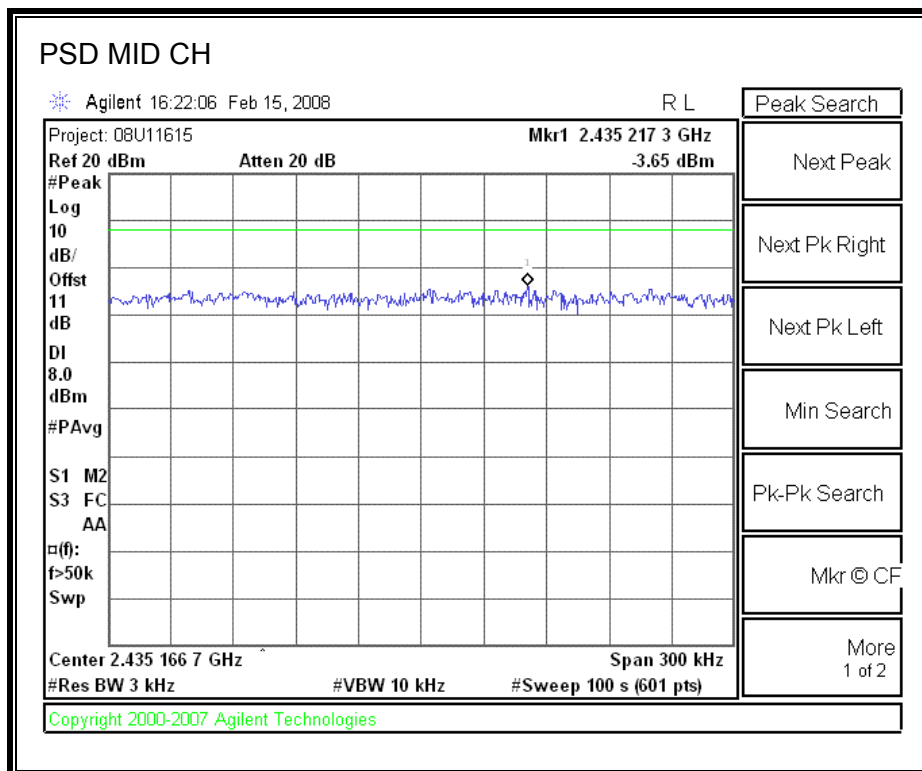
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

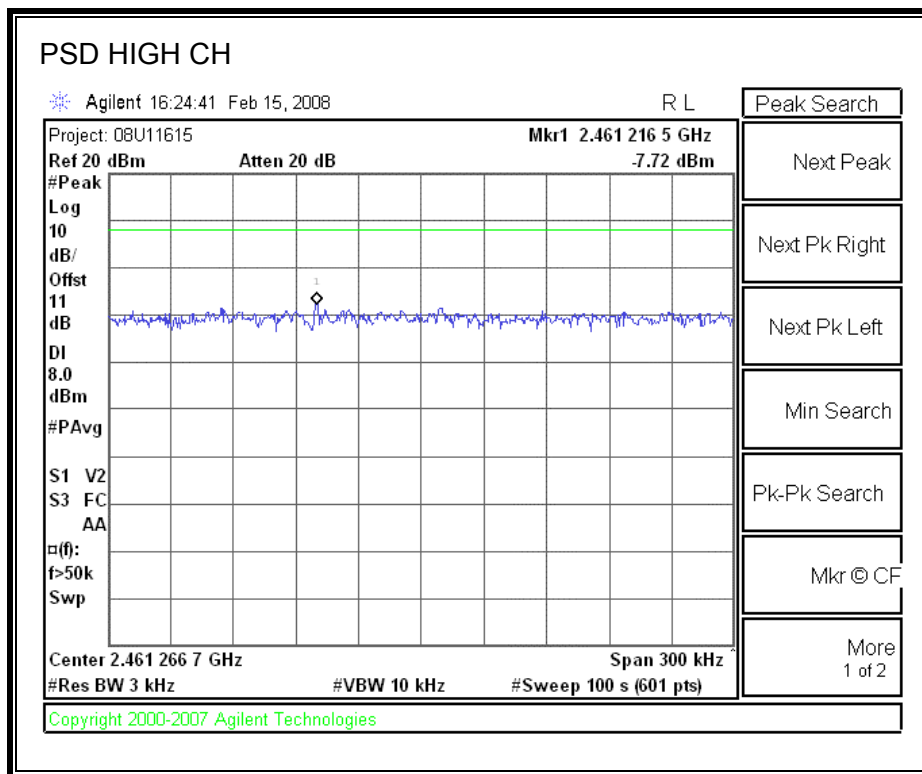
### RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-6.94	8	-14.94
Middle	2437	-3.65	8	-11.65
High	2462	-7.72	8	-15.72

**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.

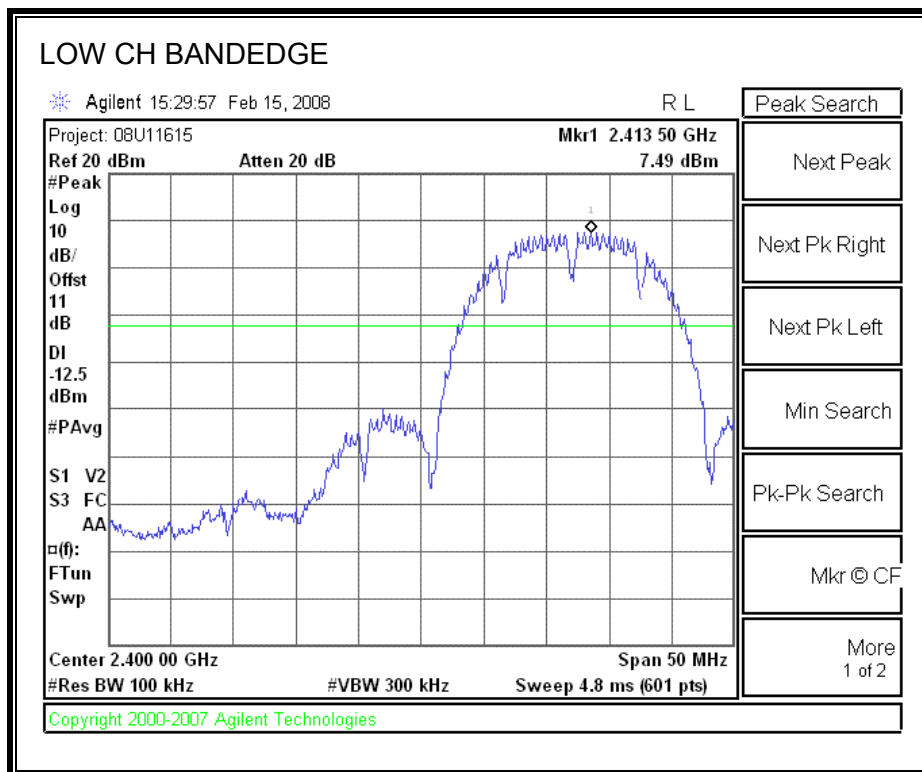
### **TEST PROCEDURE**

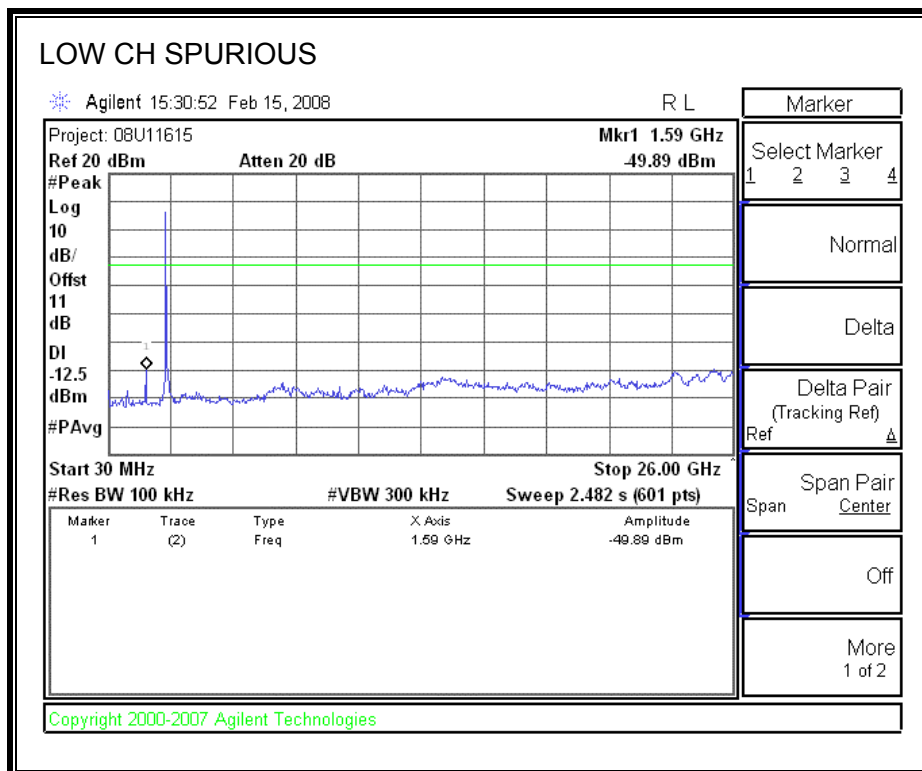
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

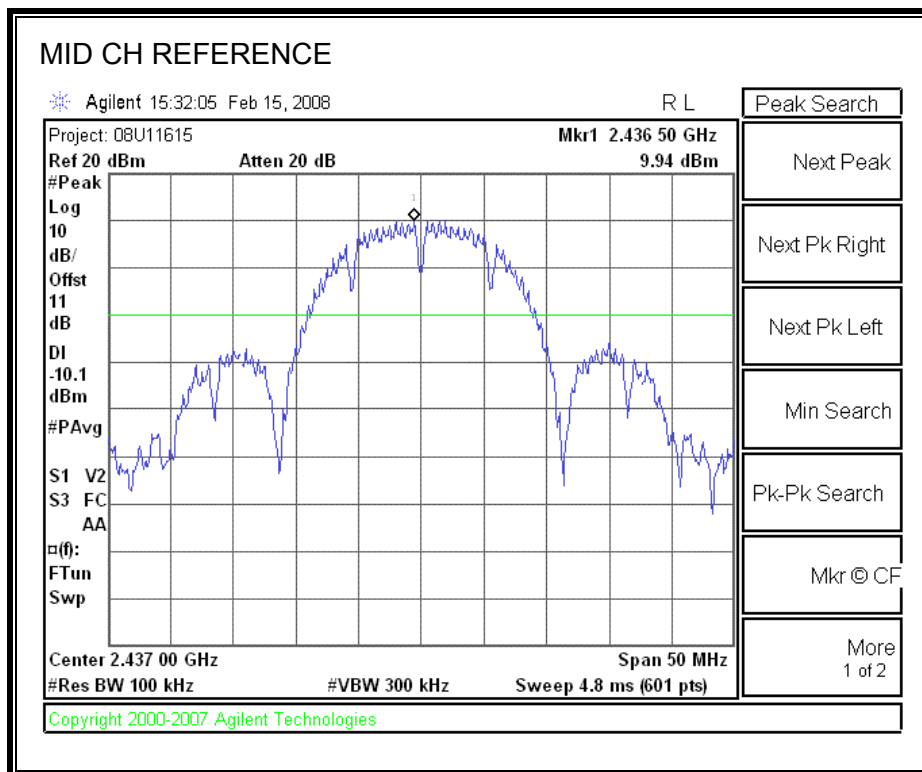
### **RESULTS**

**SPURIOUS EMISSIONS, LOW CHANNEL**

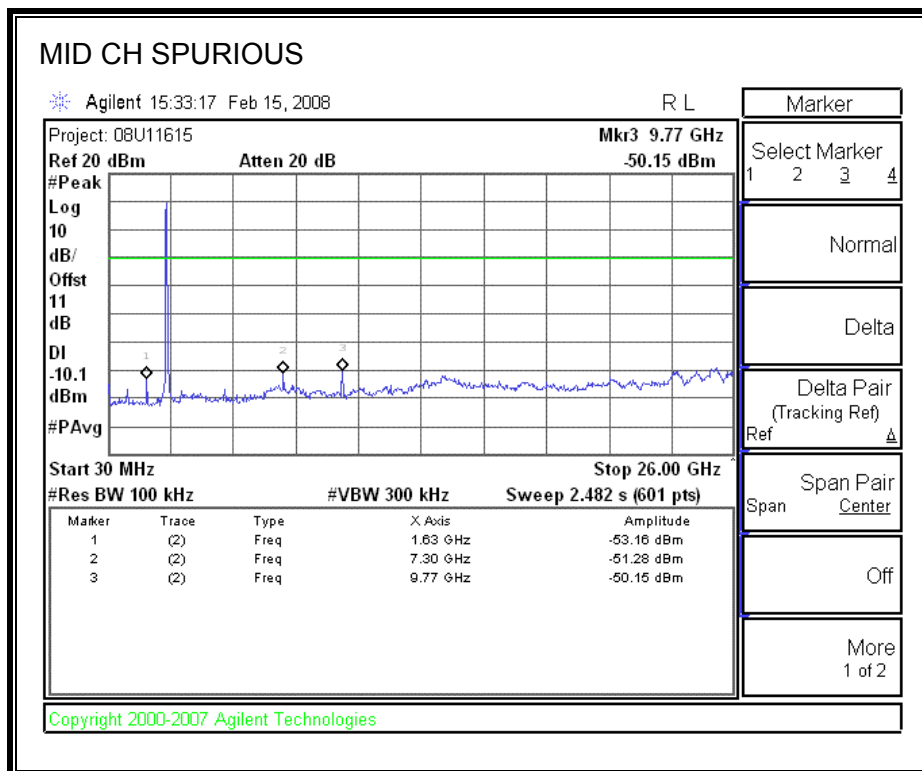




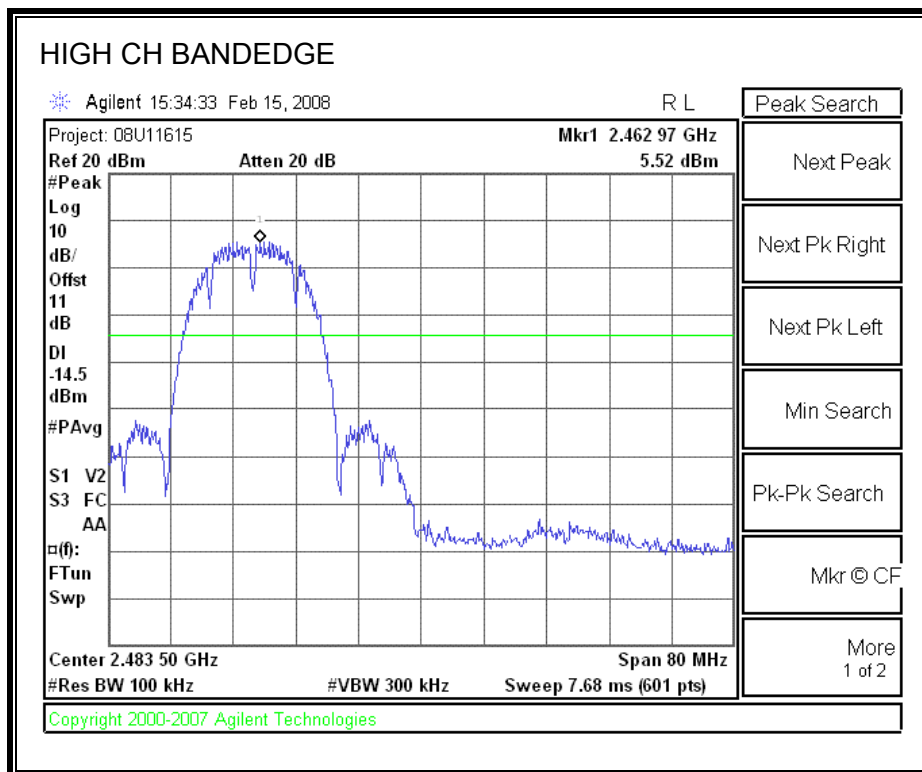
**SPURIOUS EMISSIONS, MID CHANNEL**

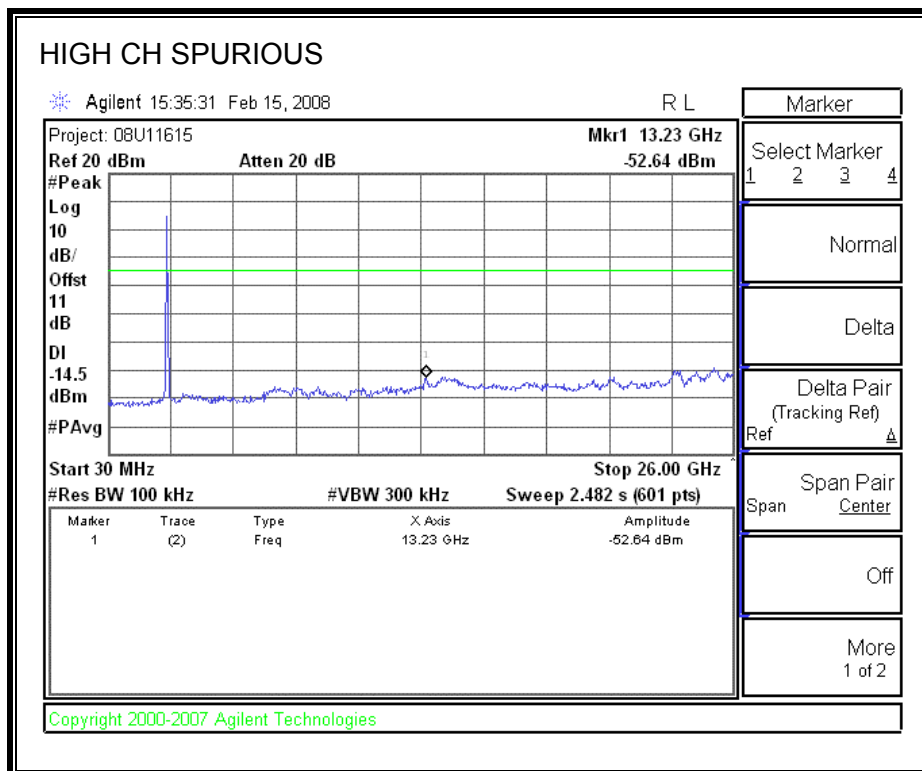






**SPURIOUS EMISSIONS, HIGH CHANNEL**





## 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.

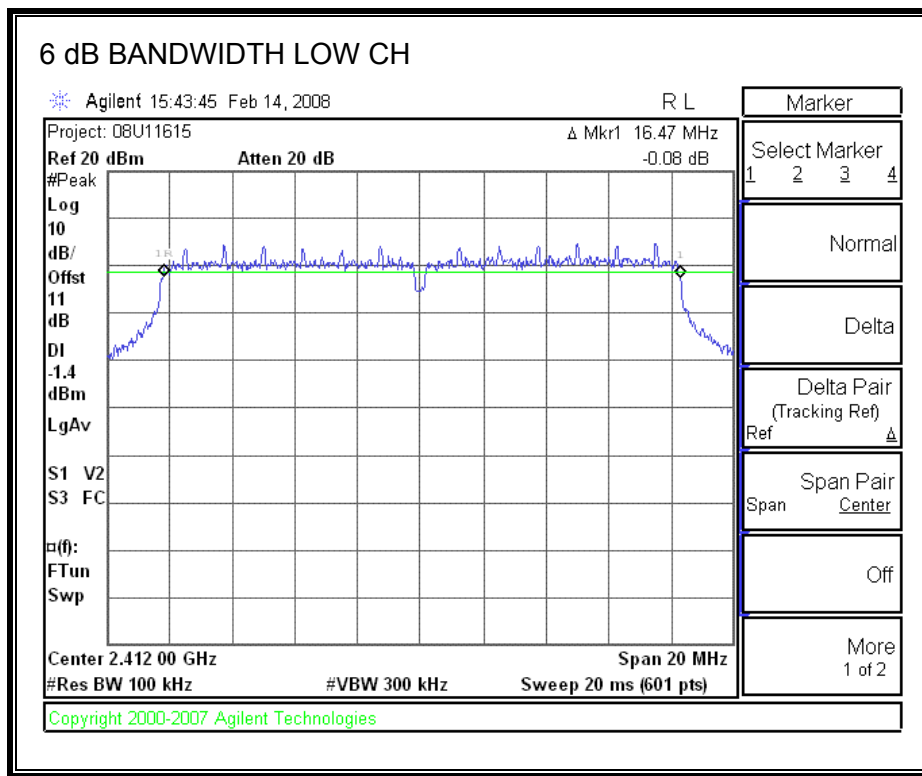
#### TEST PROCEDURE

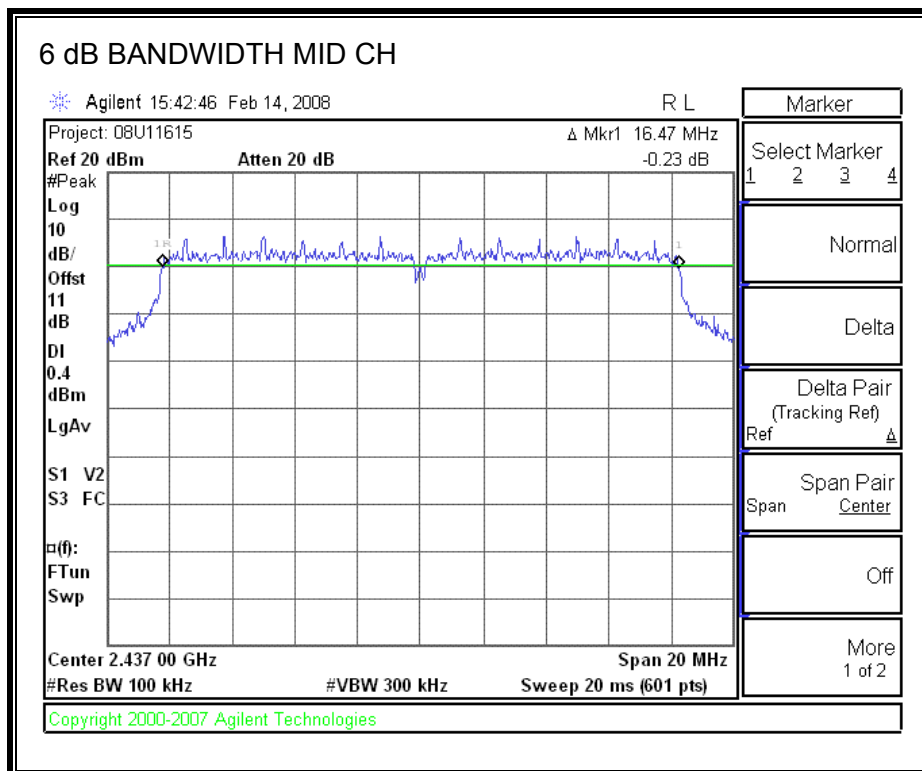
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

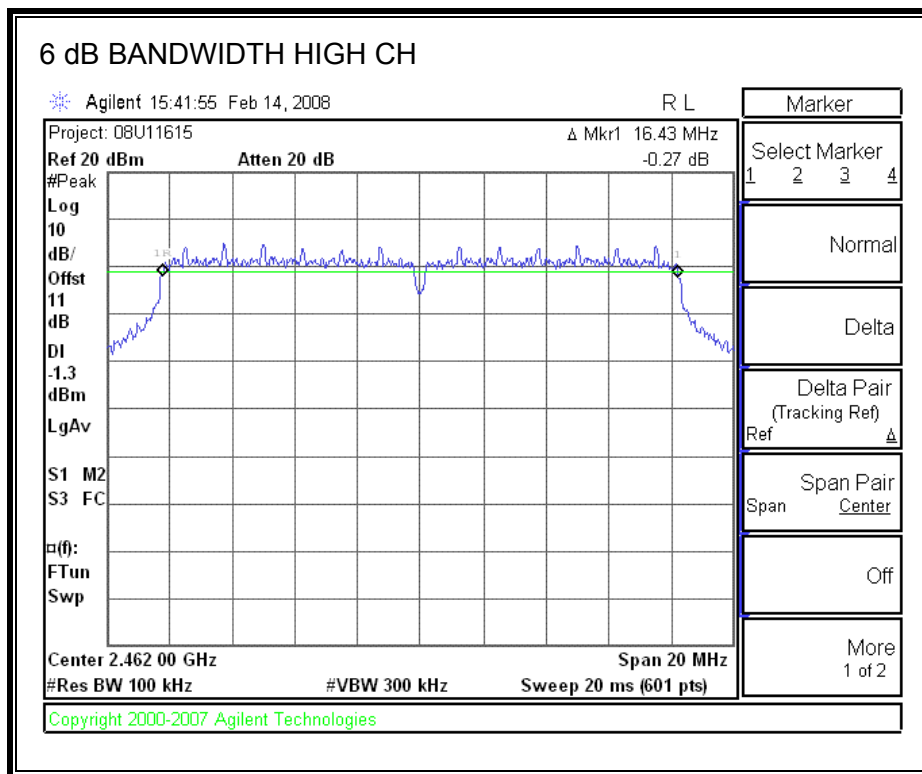
#### RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.47	0.5
Middle	2437	16.47	0.5
High	2462	16.43	0.5

## 6 dB BANDWIDTH







## 7.2.2. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

### TEST PROCEDURE

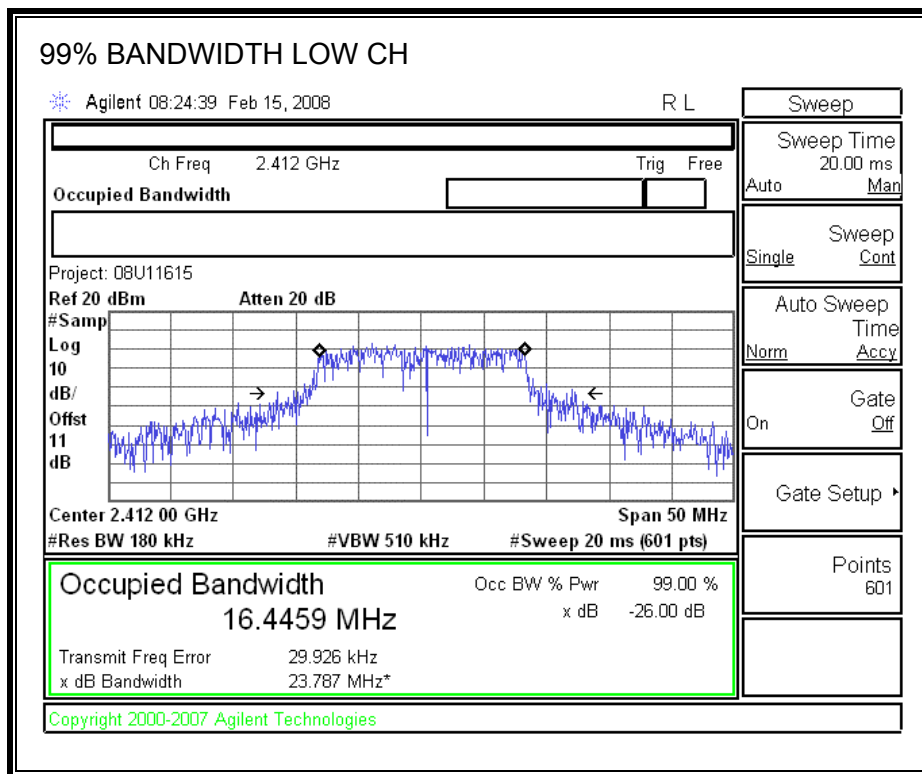
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

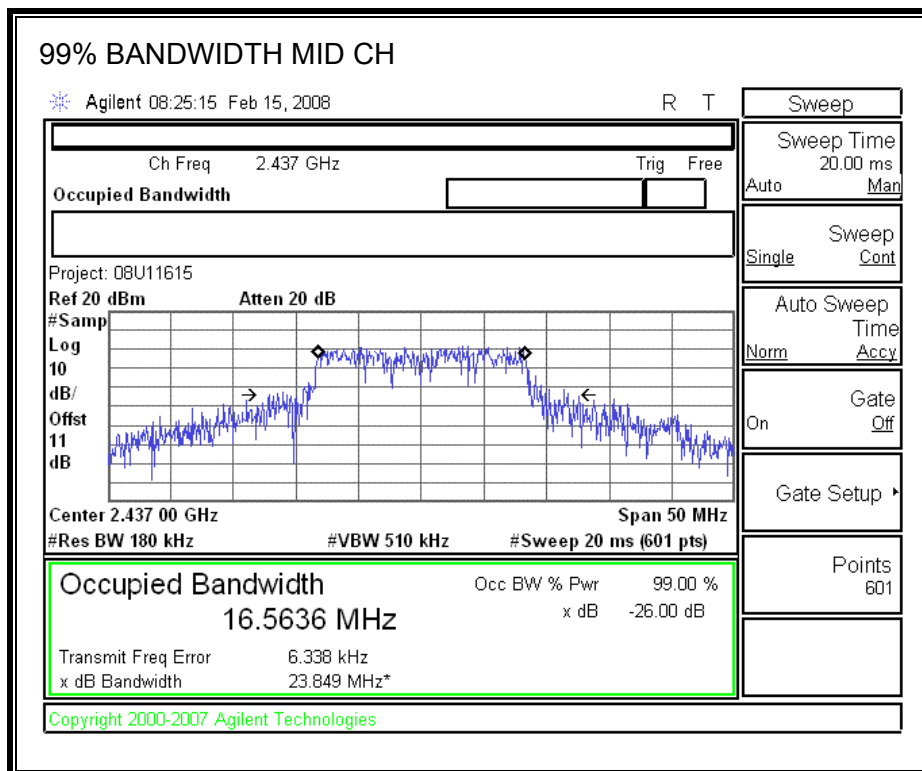
### RESULTS

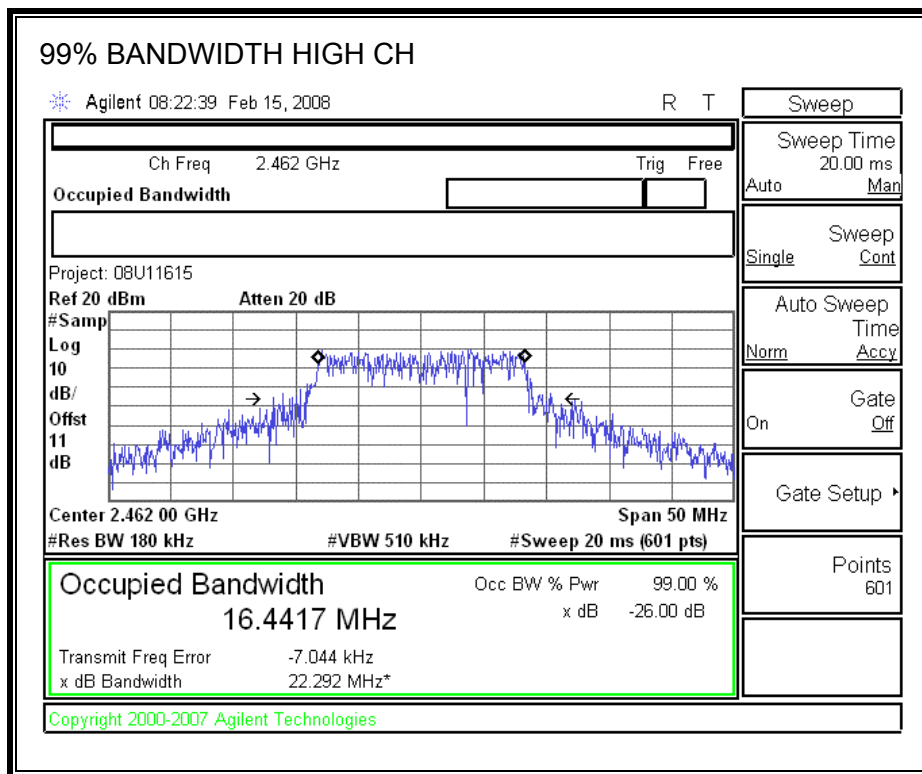
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.4459
Middle	2437	16.5636
High	2462	16.4417



# **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.

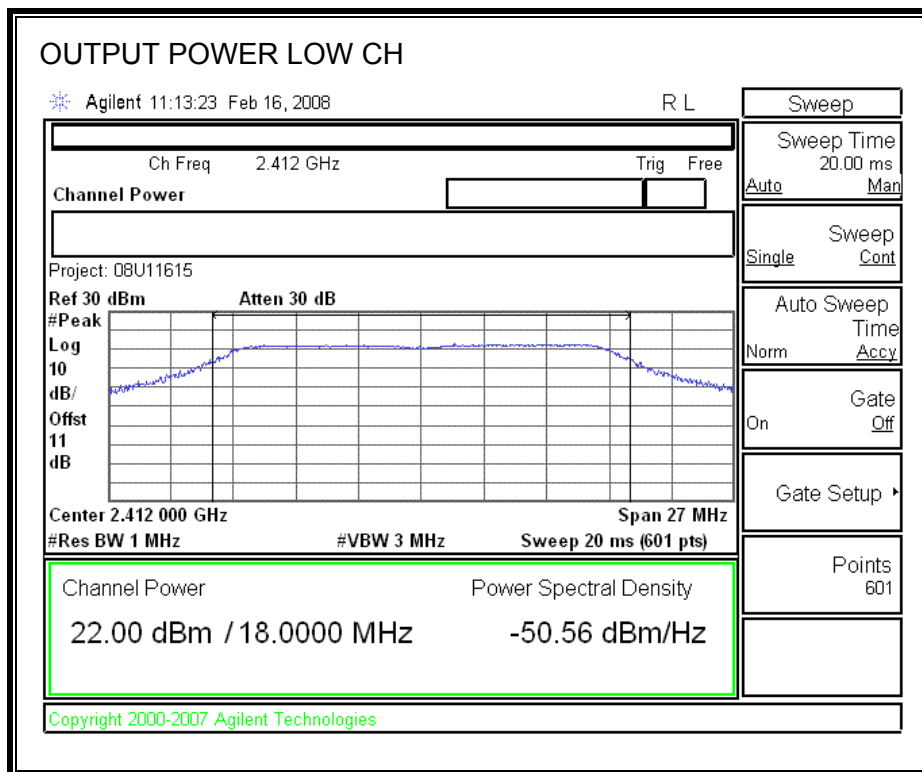
#### TEST PROCEDURE

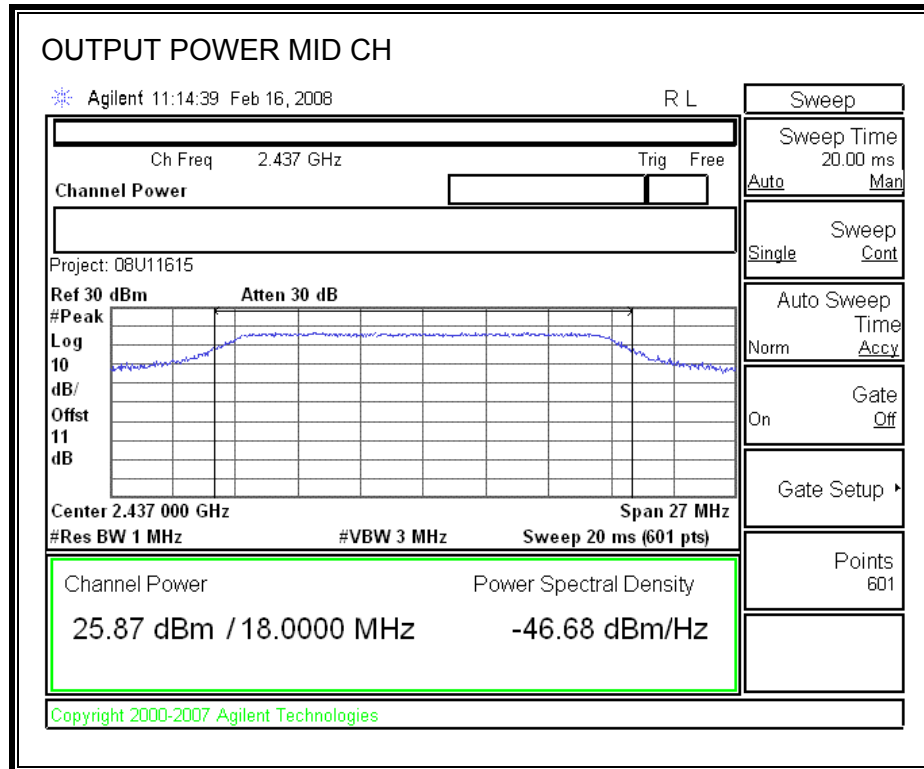
Peak power is measured using the spectrum analyzer's internal channel power integration function. Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.

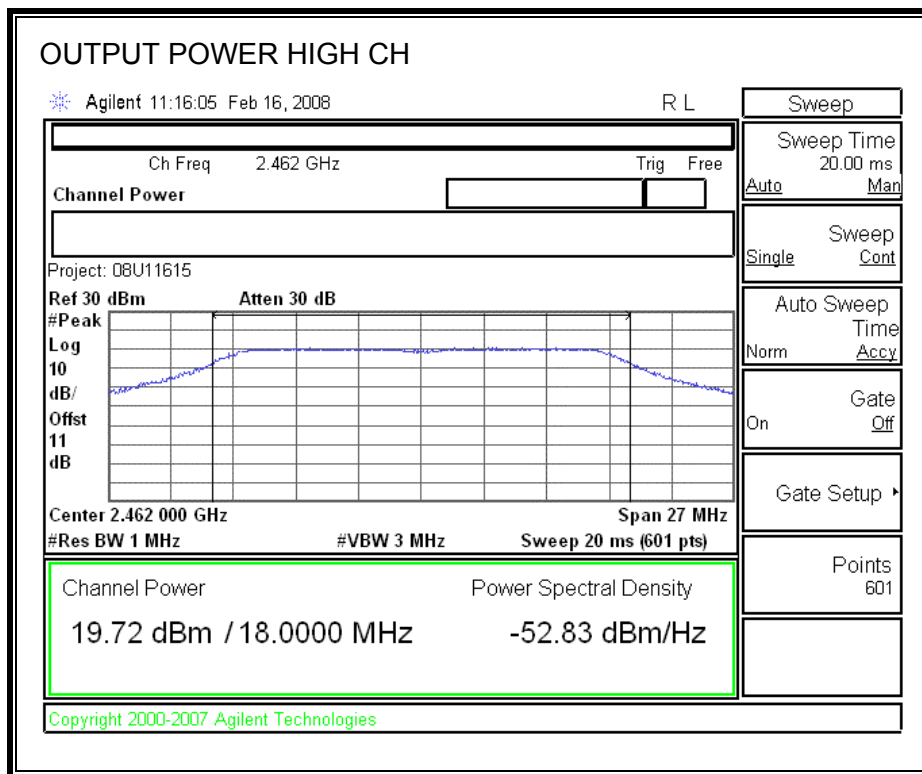
#### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	22.00	30	-8.00
Middle	2437	25.97	30	-4.03
High	2462	19.72	30	-10.28

## 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 dB (including 10 dB pad and 1 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	15.40
Middle	2437	19.50
High	2462	13.40



## 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.

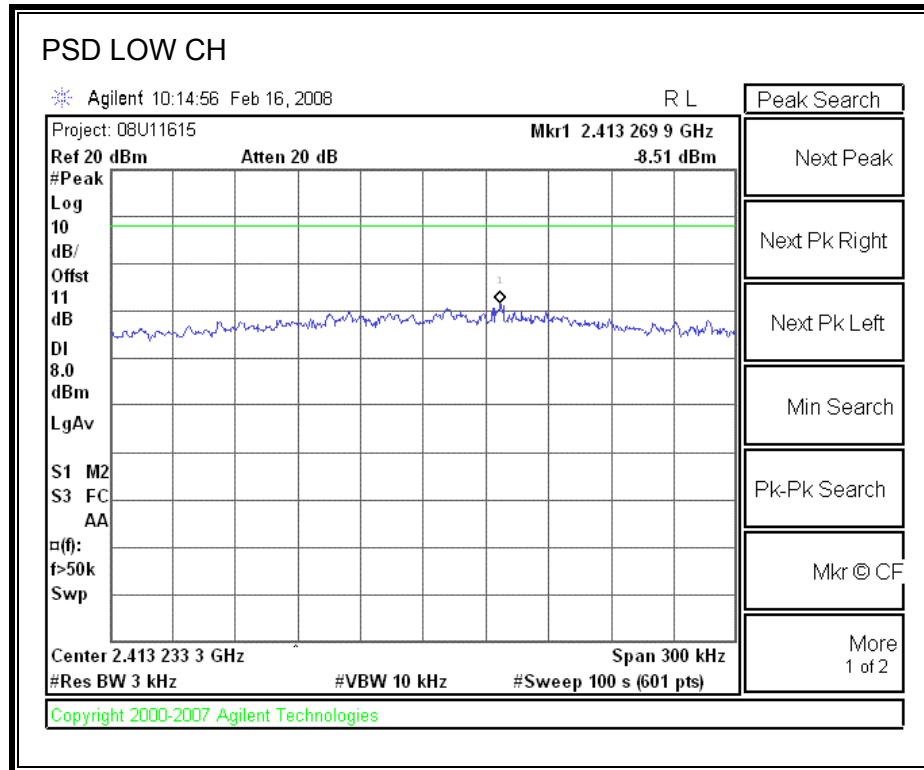
### TEST PROCEDURE

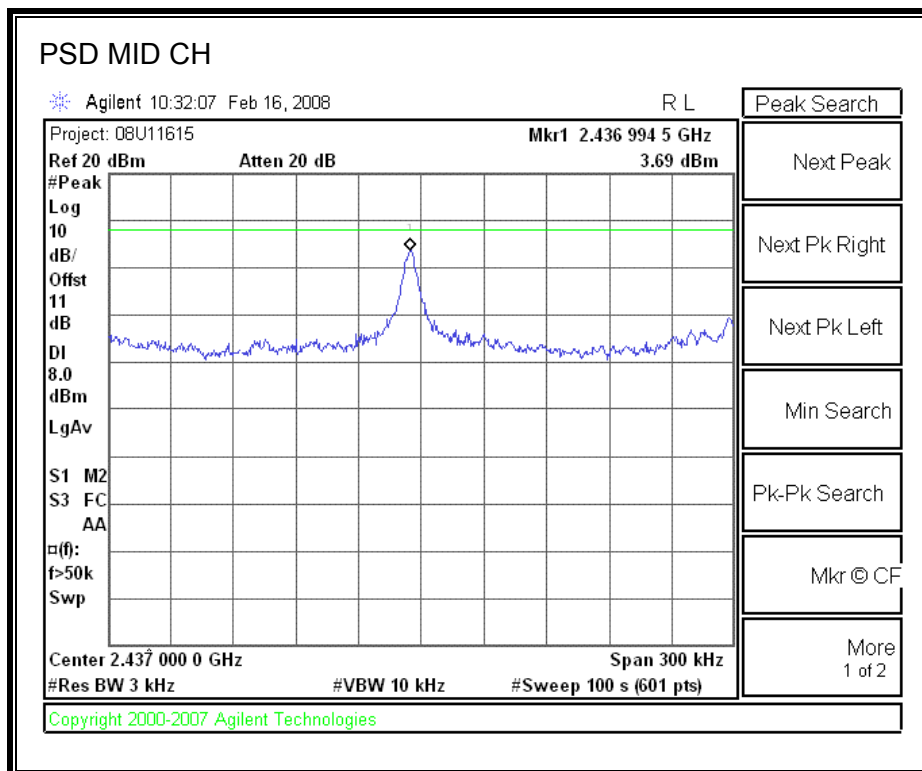
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

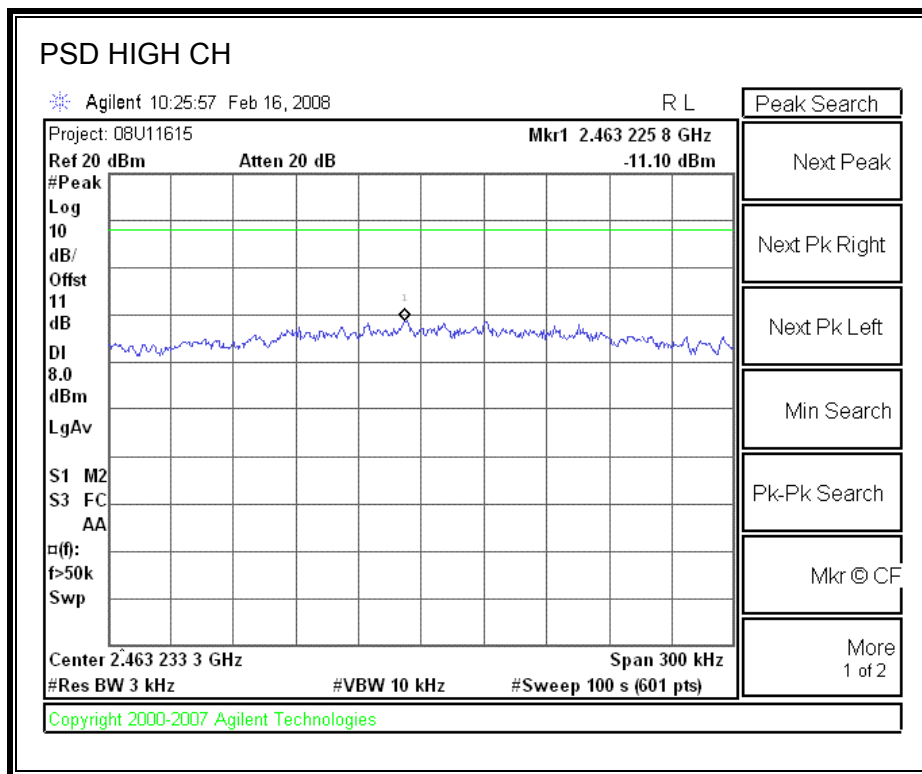
### RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-8.51	8	-16.51
Middle	2437	3.69	8	-4.31
High	2462	-11.10	8	-19.10

**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.

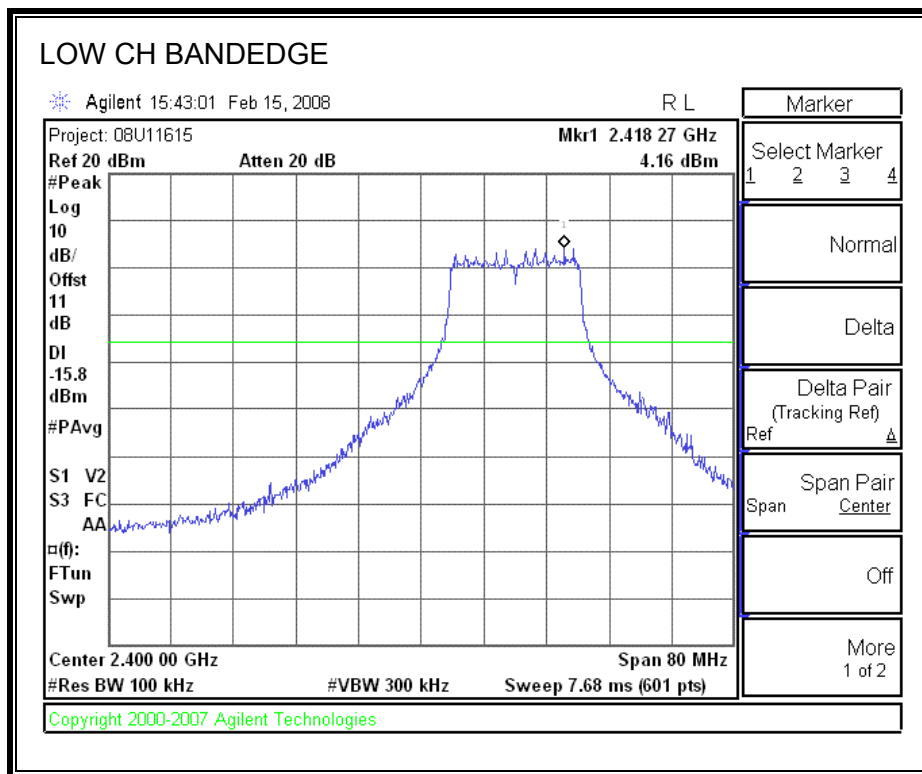
### **TEST PROCEDURE**

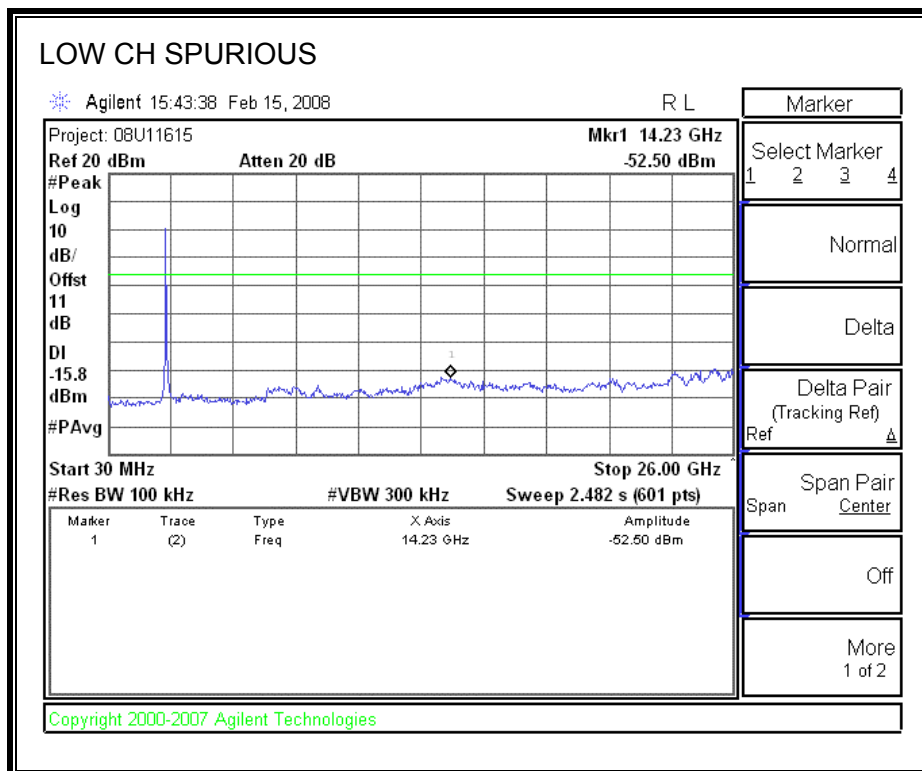
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

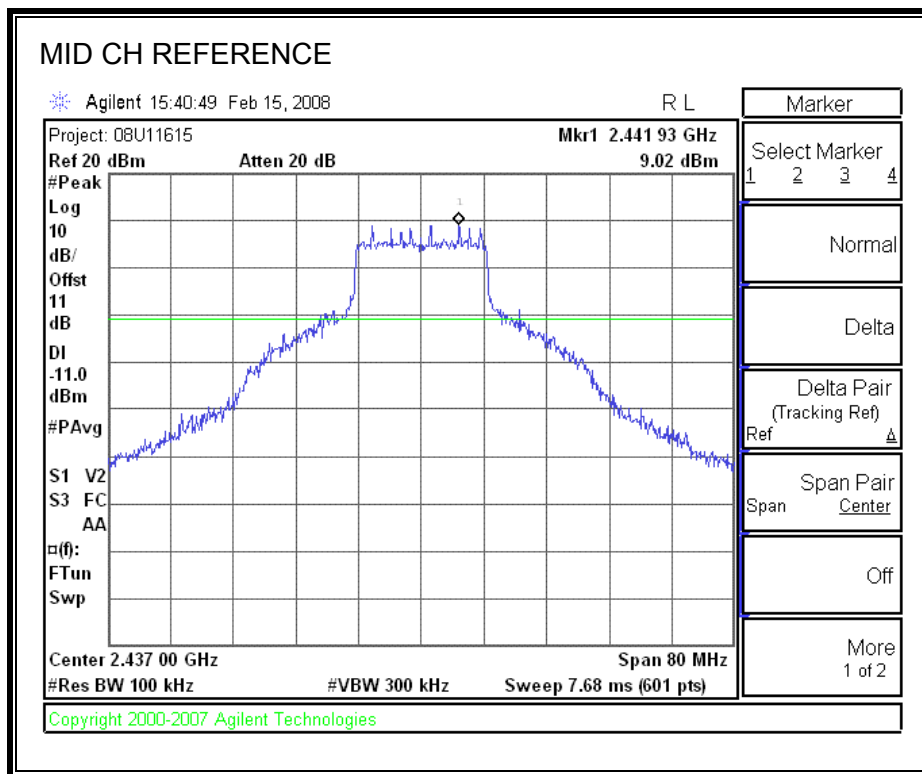
### **RESULTS**

**SPURIOUS EMISSIONS, LOW CHANNEL**

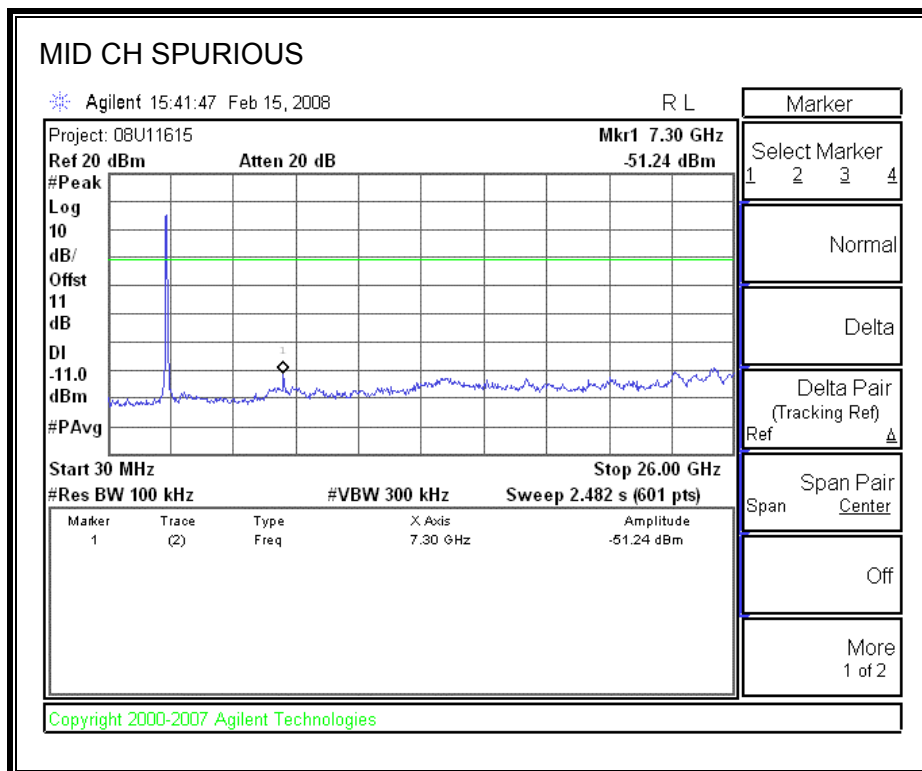




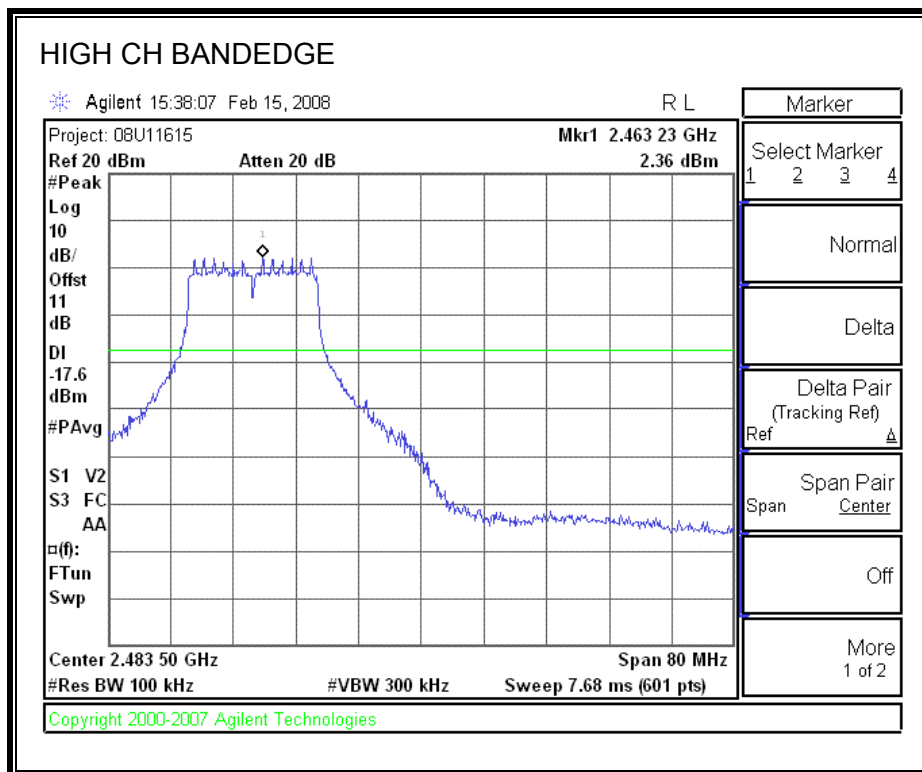
**SPURIOUS EMISSIONS, MID CHANNEL**

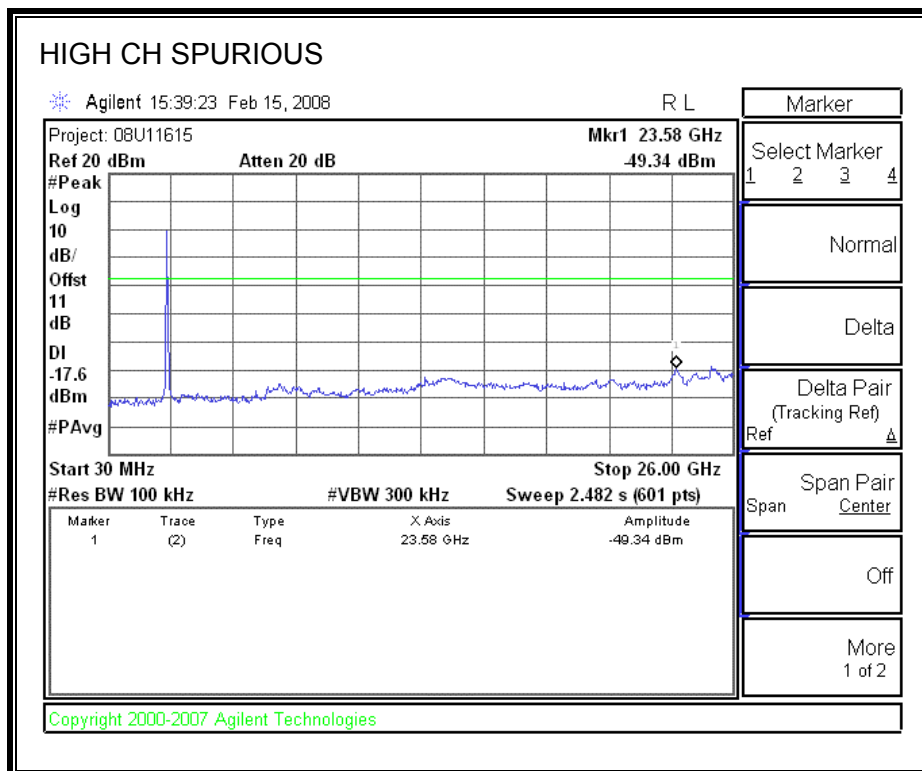






**SPURIOUS EMISSIONS, HIGH CHANNEL**





### 7.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

#### 7.3.1. 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.

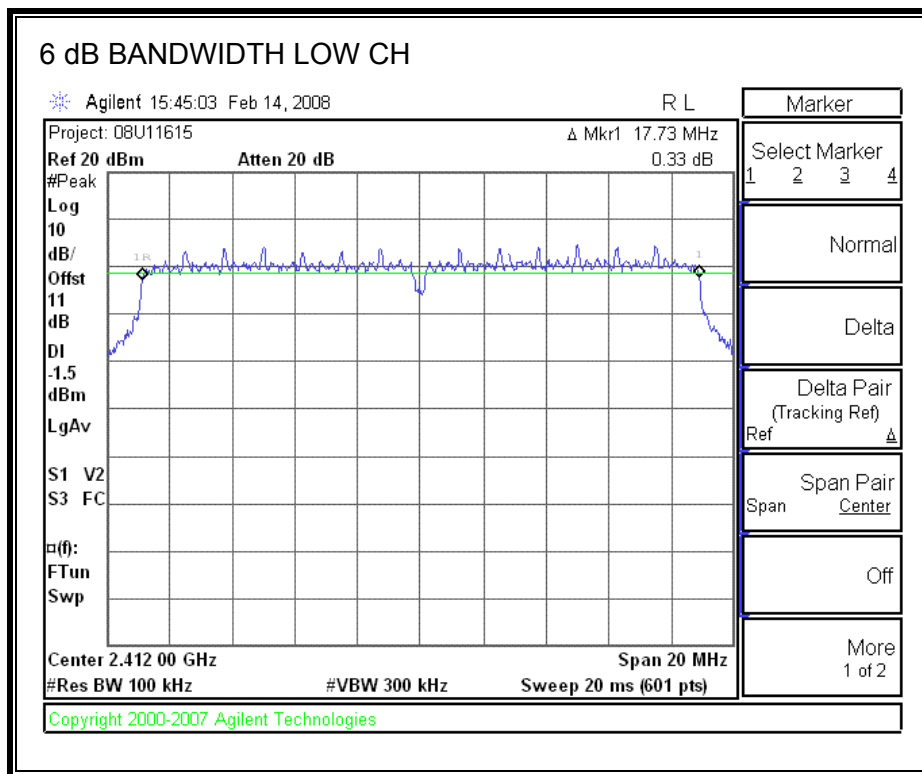
##### TEST PROCEDURE

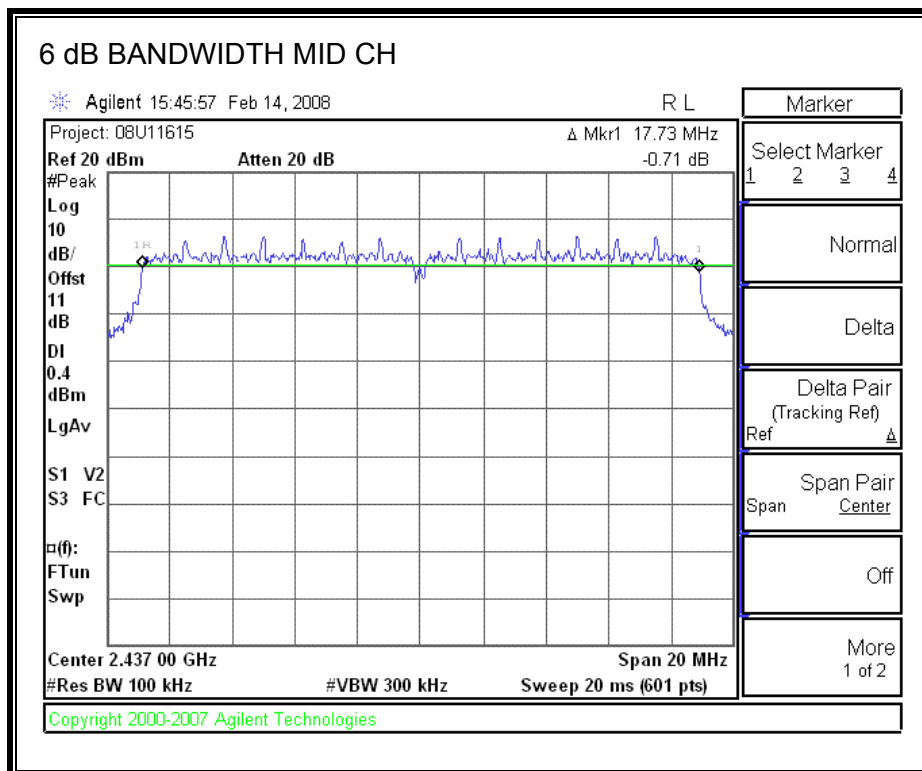
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

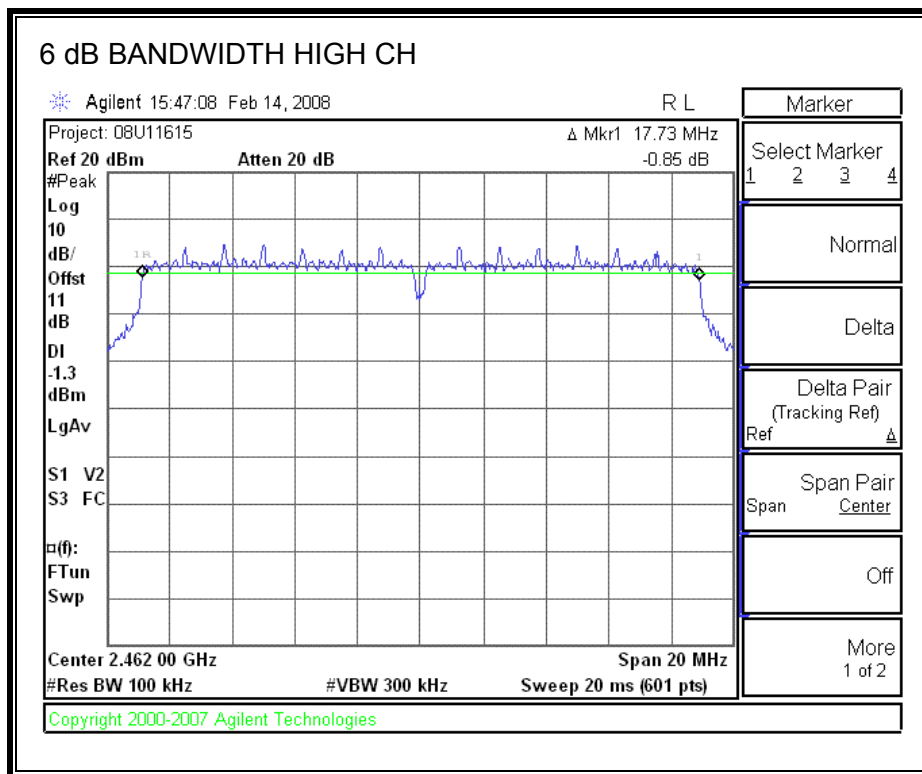
##### RESULTS

Channel	Frequency (MHz)	6 dB BW (MHz)	Minimum Limit (MHz)
Low	2412	17.73	0.5
Middle	2437	17.73	0.5
High	2462	17.73	0.5

## 6 dB BANDWIDTH







### 7.3.2. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

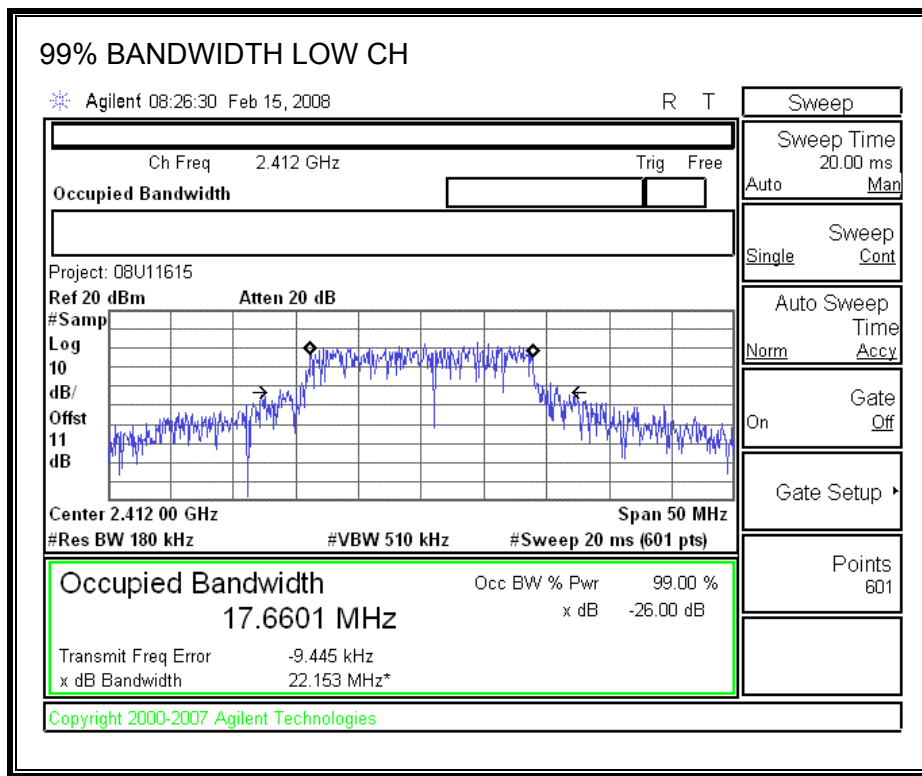
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

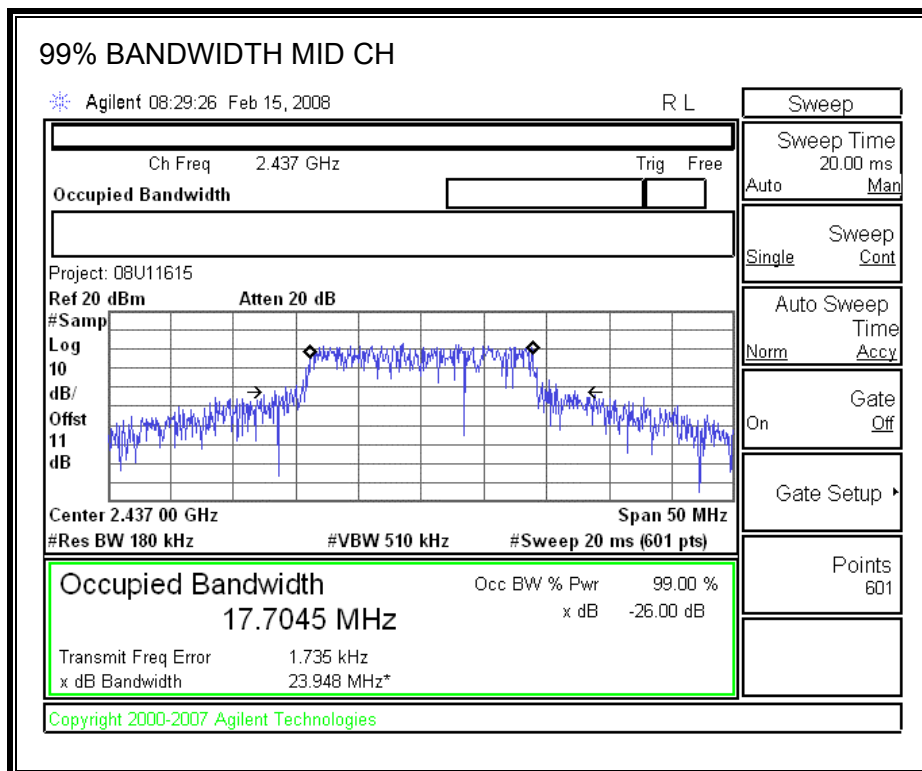
#### RESULTS

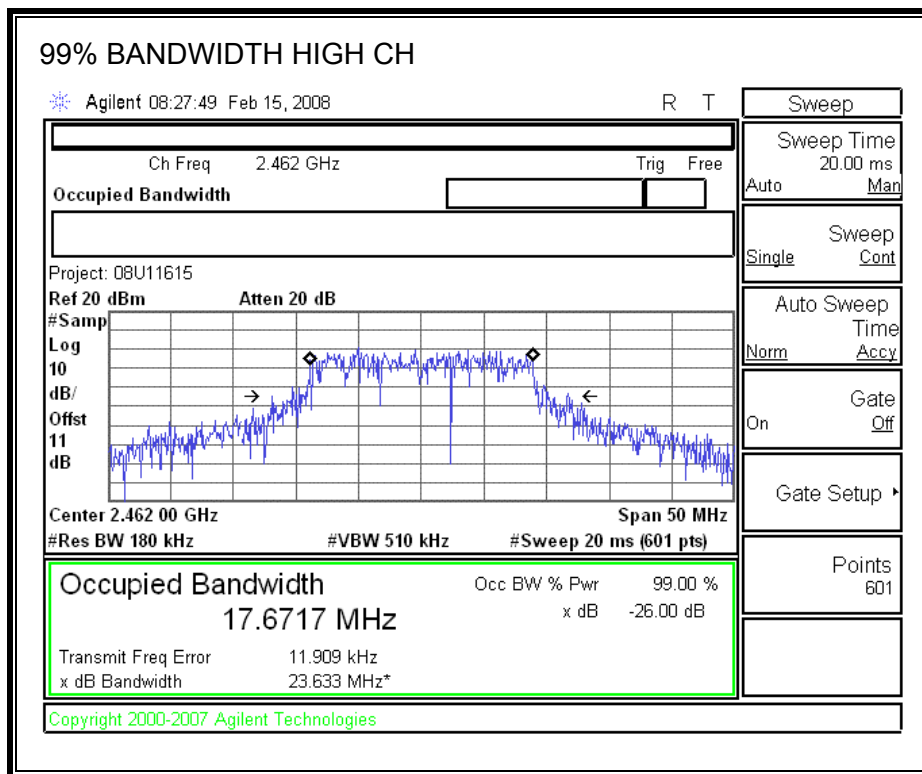
Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	2412	17.6601
Middle	2437	17.7045
High	2462	17.6717



**99% BANDWIDTH**







### 7.3.3. 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.

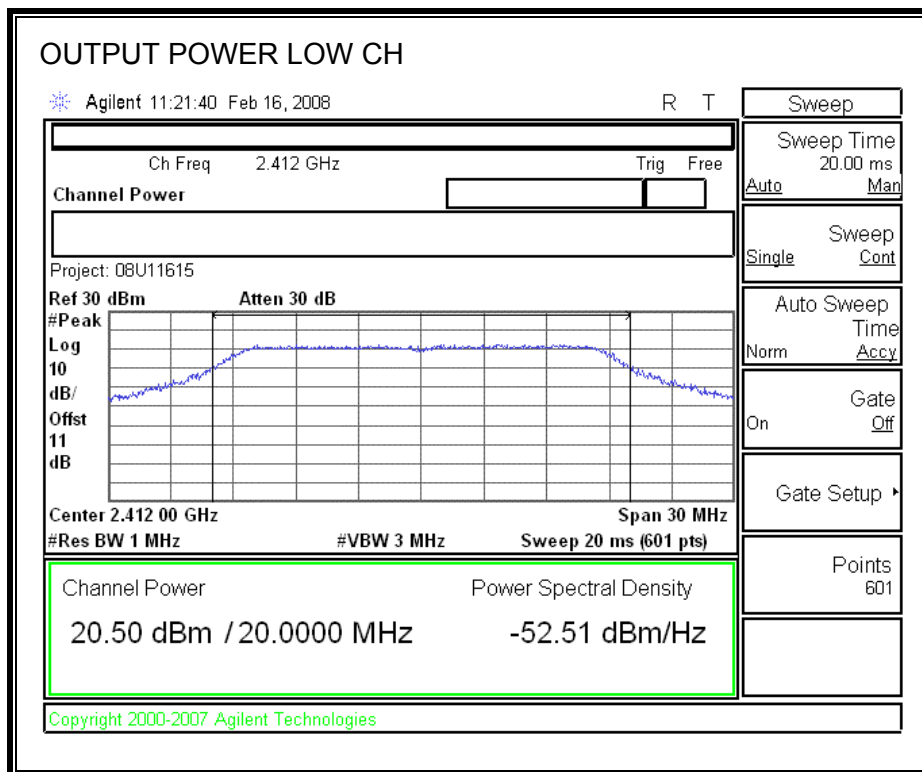
#### TEST PROCEDURE

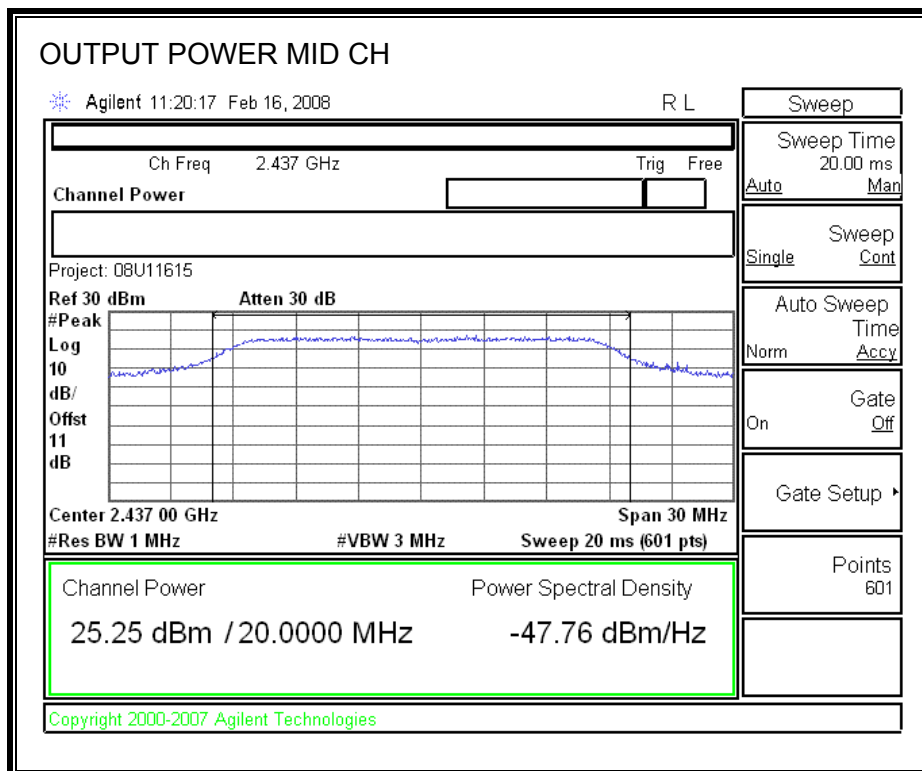
Peak power is measured using the spectrum analyzer's internal channel power integration function. Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.

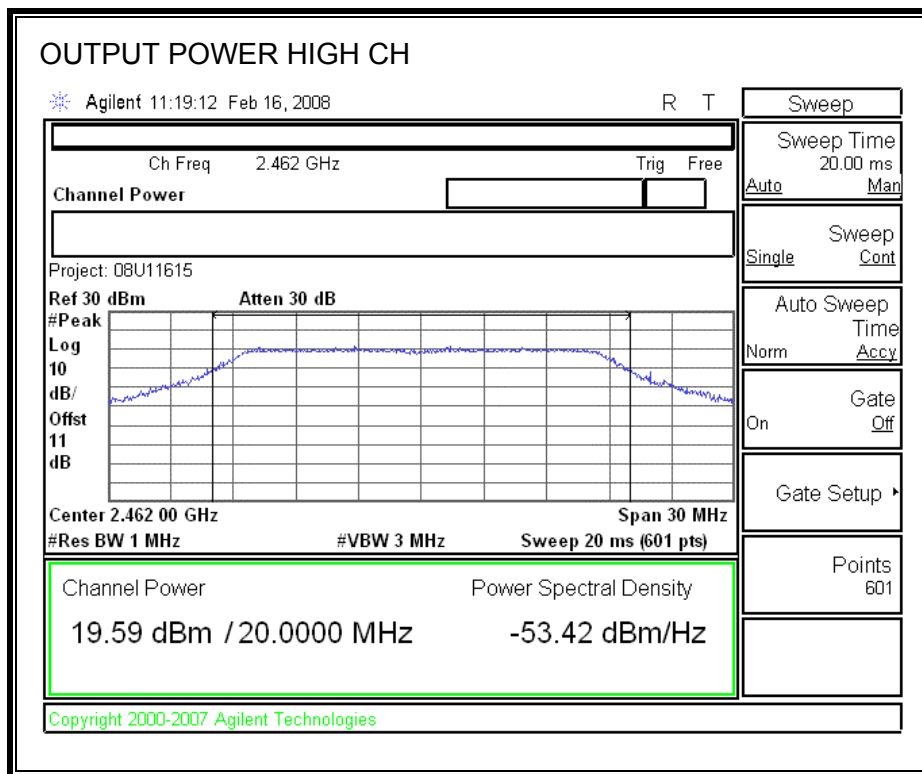
#### RESULTS

Channel	Frequency	Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	20.50	30.00	-9.50
Mid	2437	25.25	30.00	-4.75
High	2462	19.59	30.00	-10.41

## OUTPUT POWER







### 7.3.4. 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 11dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	13.76
Middle	2437	19.00
High	2462	13.60



### 7.3.5. 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.

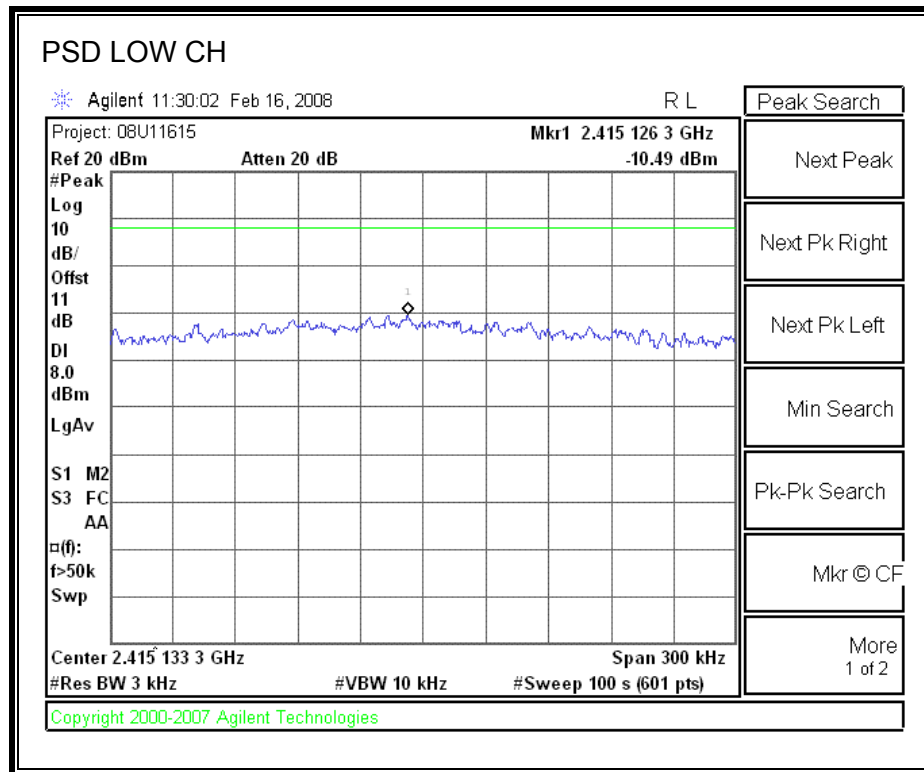
#### TEST PROCEDURE

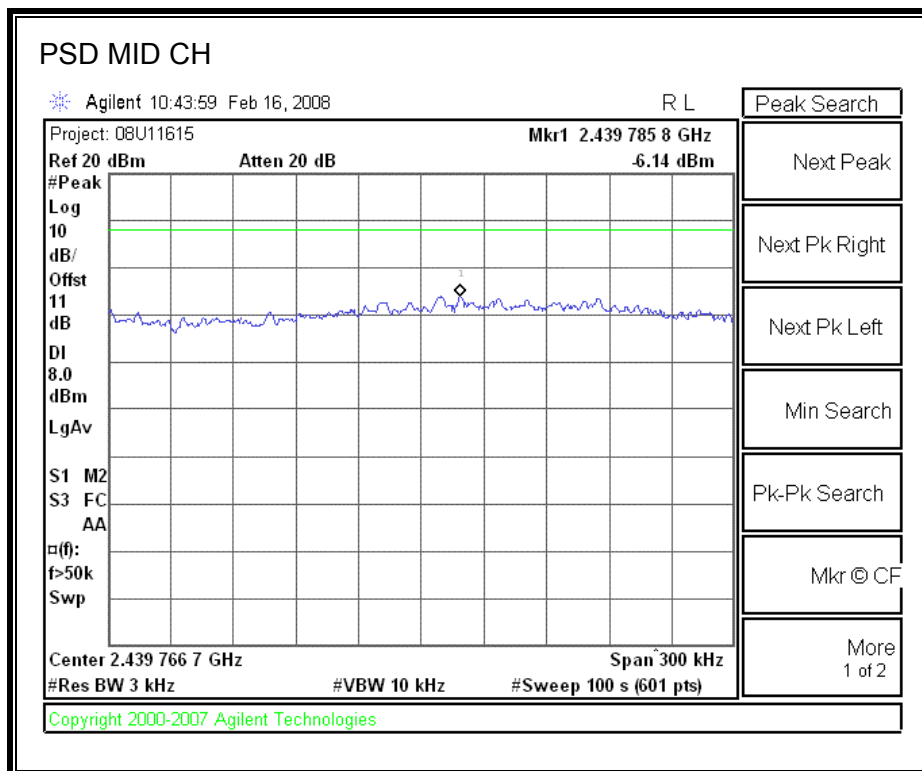
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

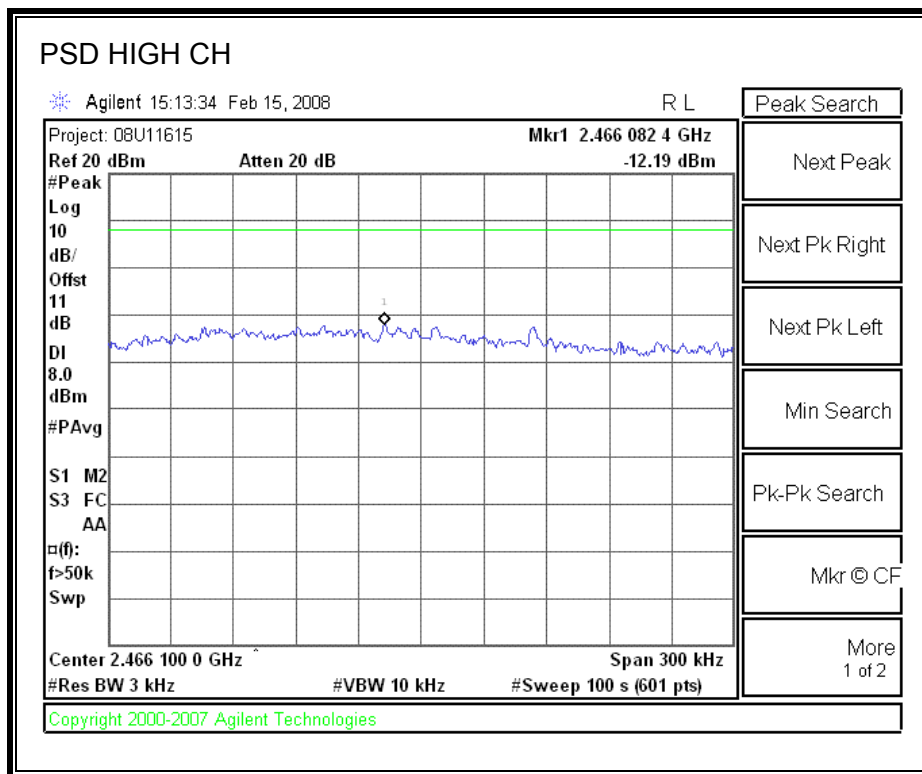
#### RESULTS

Channel	Frequency	PSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	-10.49	8	-18.49
Middle	2437	-6.14	8	-14.14
High	2462	-12.19	8	-20.19

**POWER SPECTRAL DENSITY**







### **7.3.6. 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.

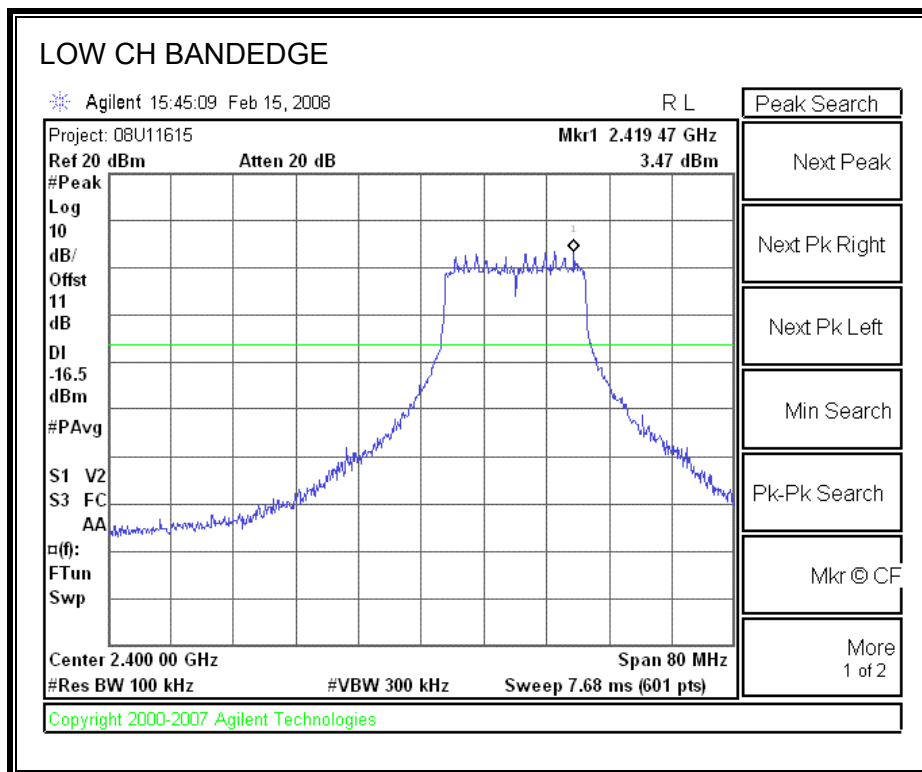
#### **TEST PROCEDURE**

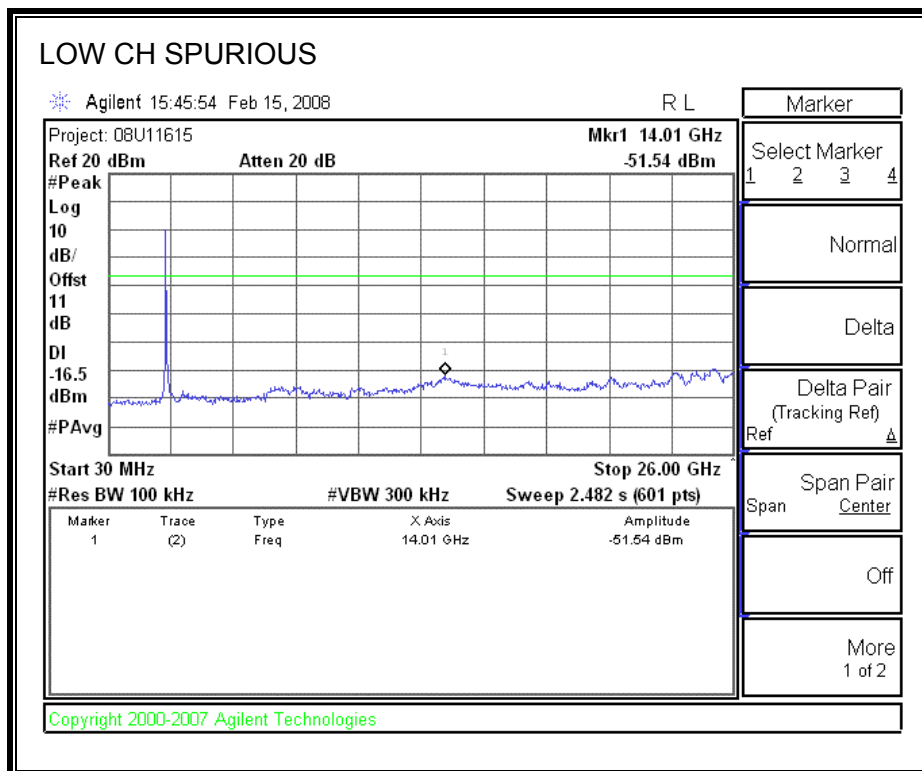
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

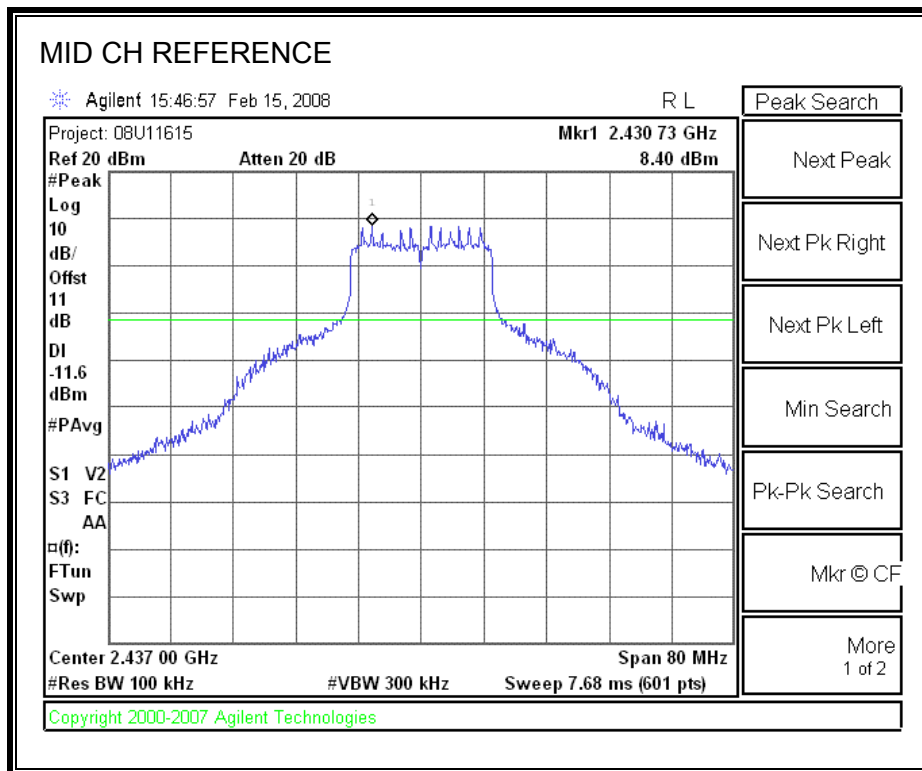
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

#### **RESULTS**

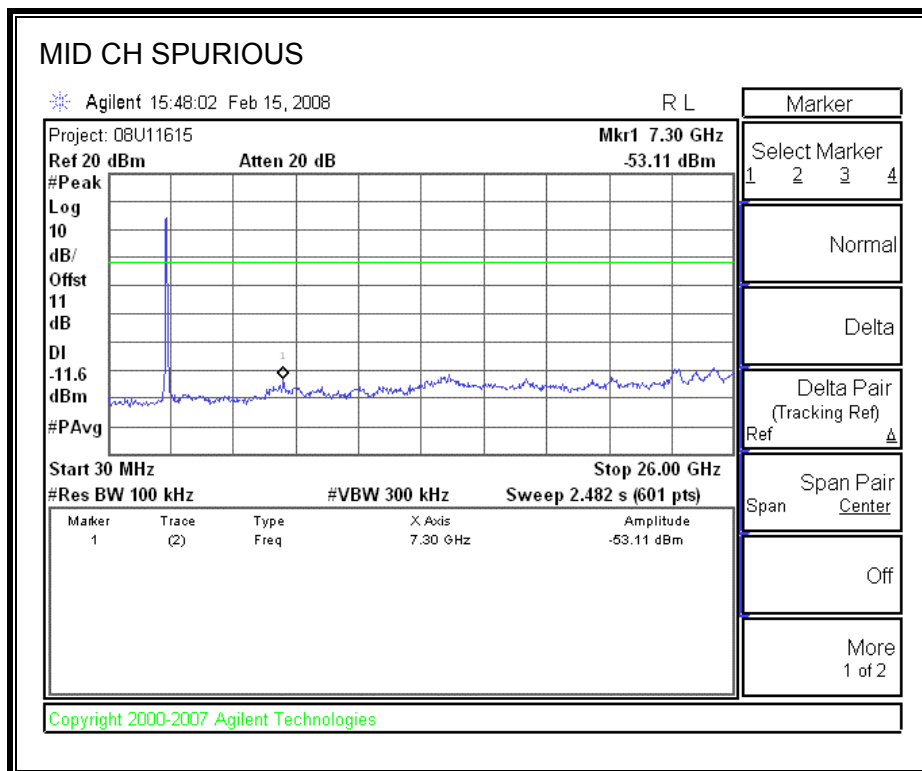
## SPURIOUS EMISSIONS

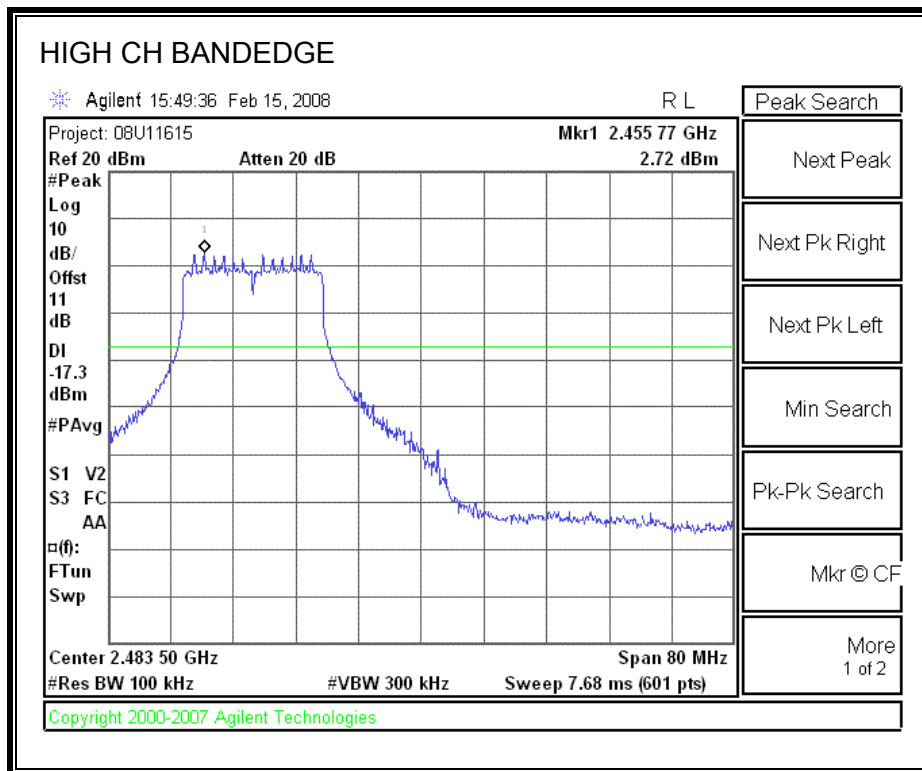


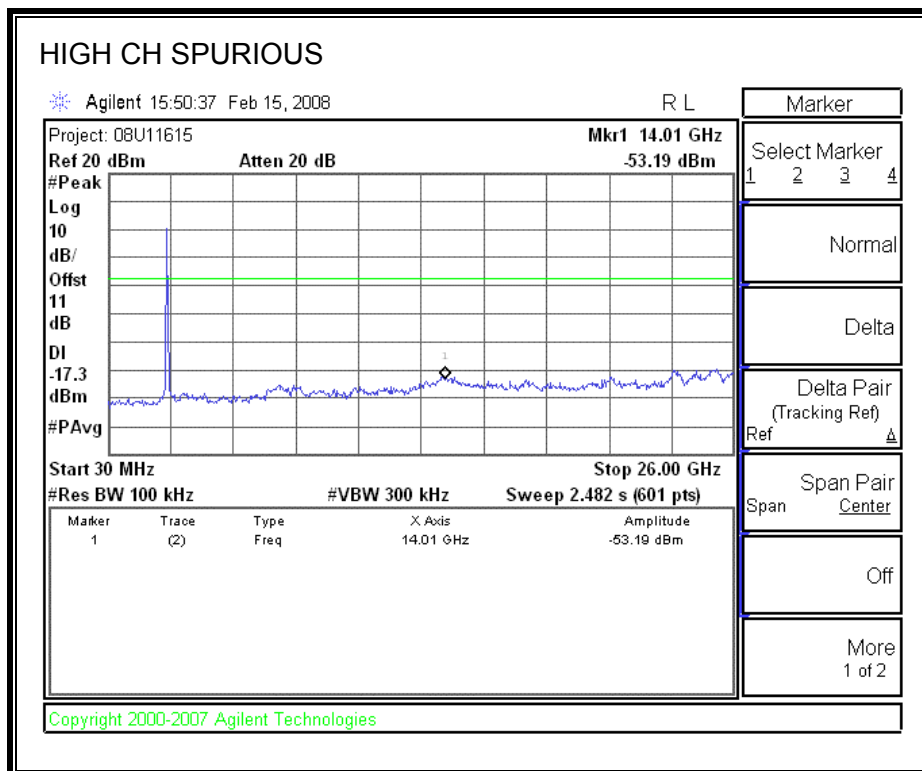












## **7.4. 802.11n HT40 MODE IN THE 2.4 GHz BAND**

### **7.4.1. 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.

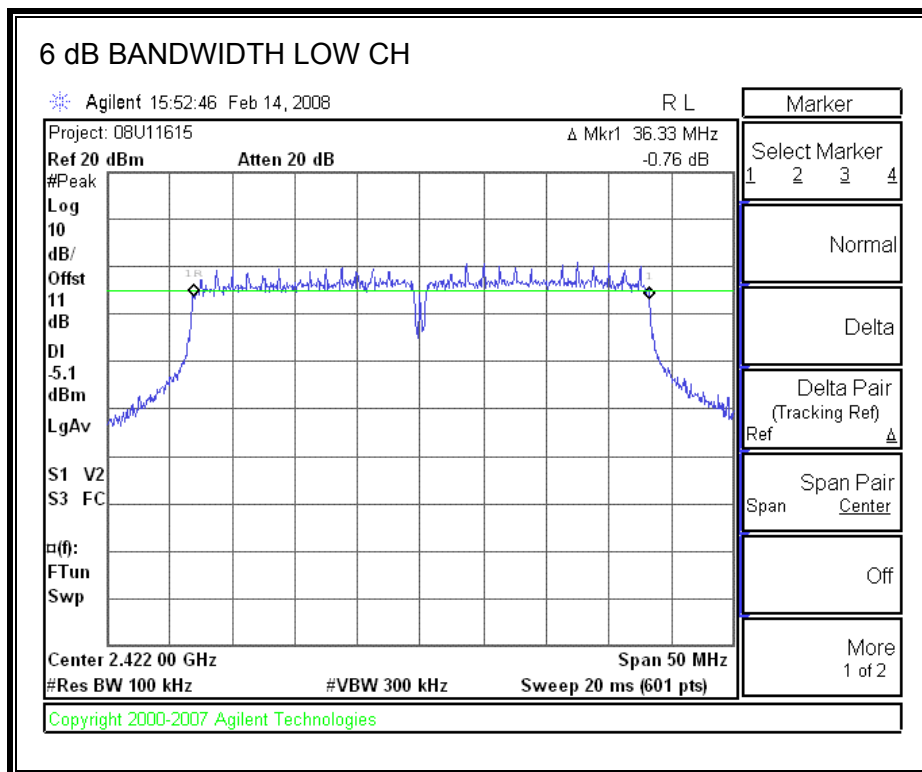
#### **TEST PROCEDURE**

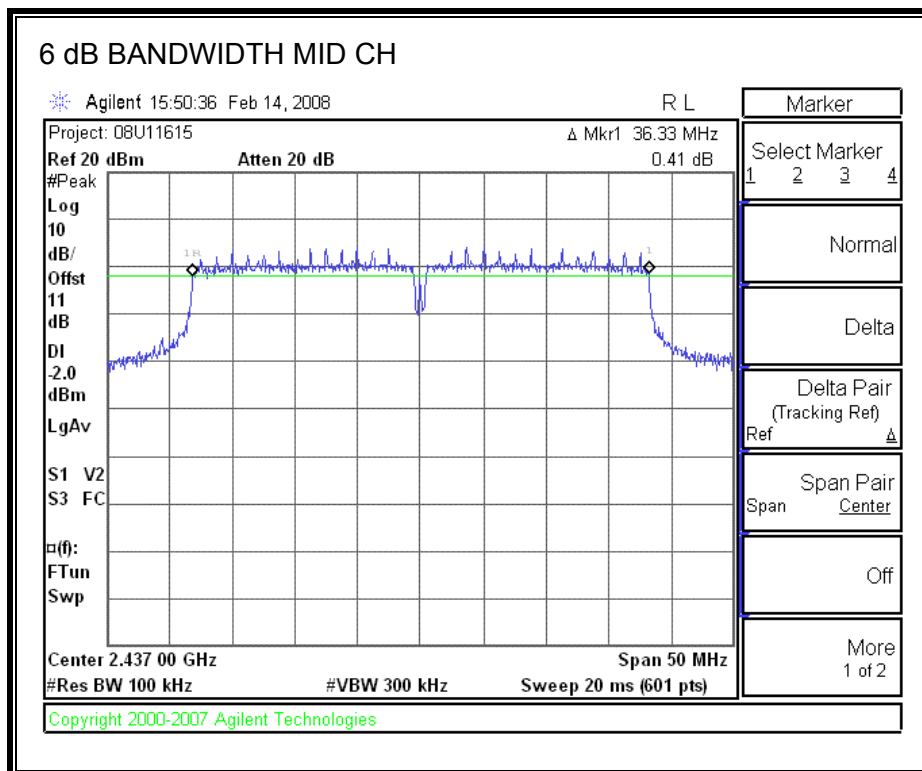
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

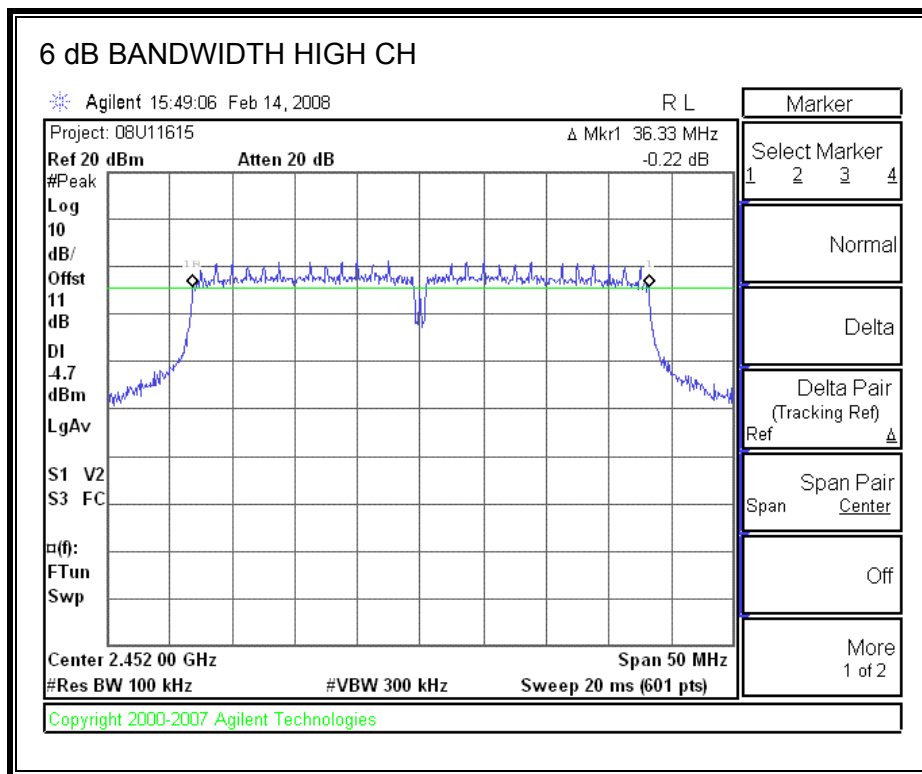
#### **RESULTS**

<b>Channel</b>	<b>Frequency</b>	<b>6 dB BW</b>	<b>Minimum Limit</b>
	<b>(MHz)</b>	<b>(MHz)</b>	<b>(MHz)</b>
Low	2422	36.33	0.5
Middle	2437	36.33	0.5
High	2452	36.33	0.5

## 6 dB BANDWIDTH







## 7.4.2. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

### TEST PROCEDURE

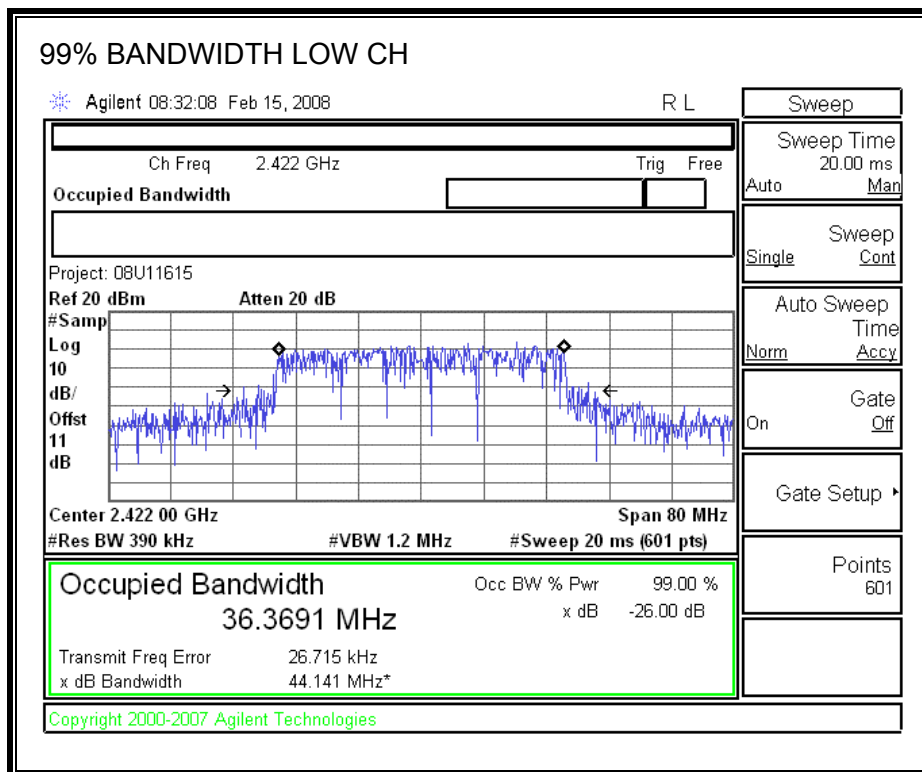
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

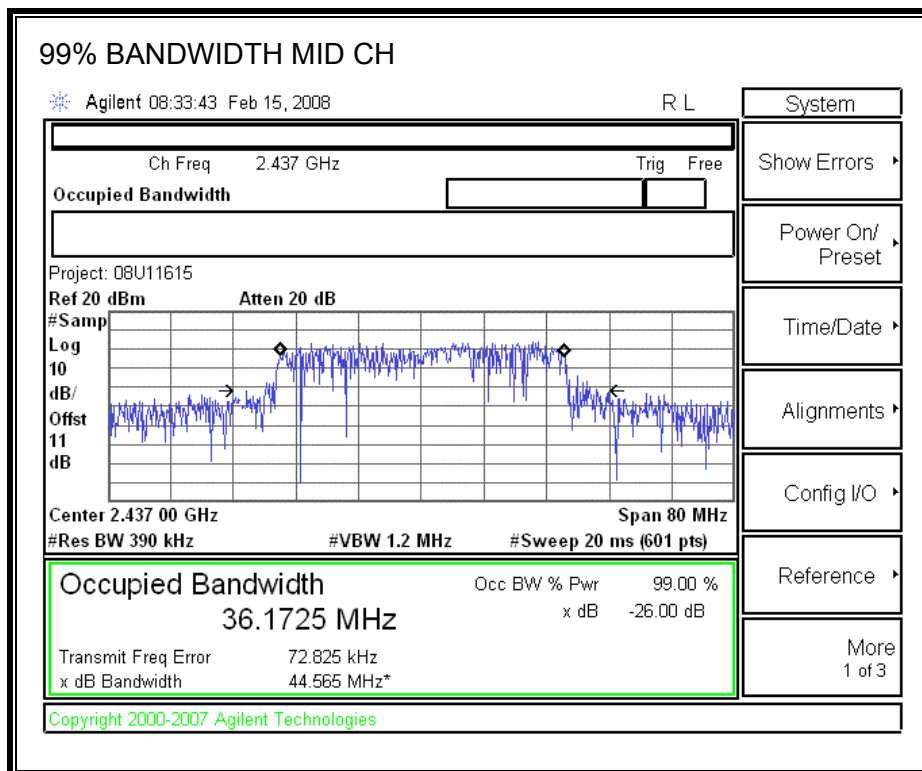
### RESULTS

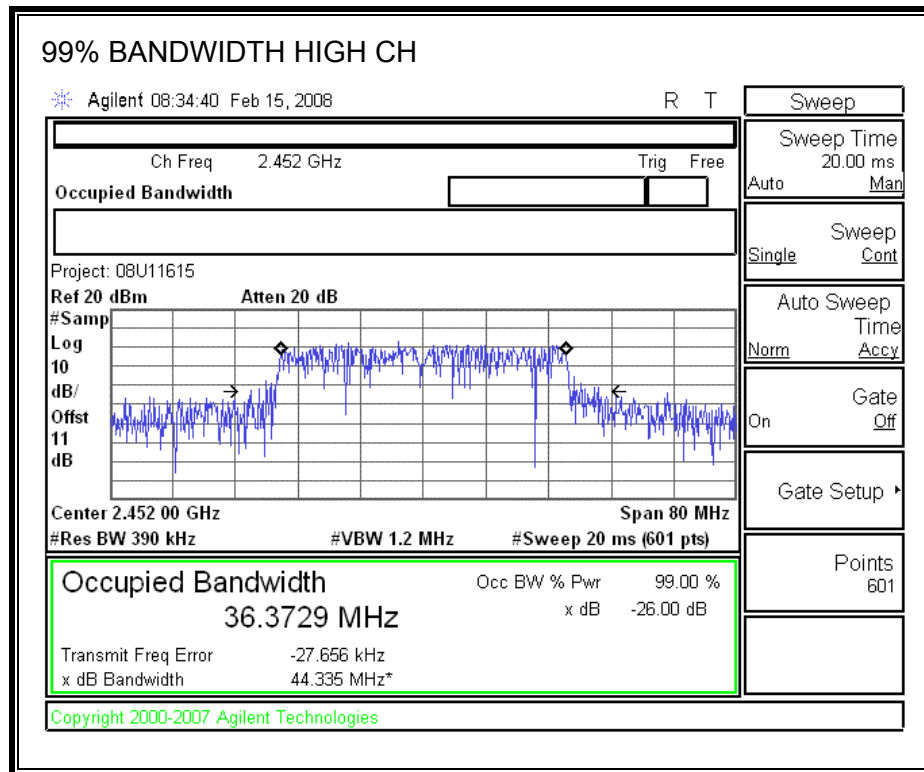
Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	2422	36.3691
Middle	2437	36.1725
High	2452	36.3729



# **99% BANDWIDTH**







### 7.4.3. 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.

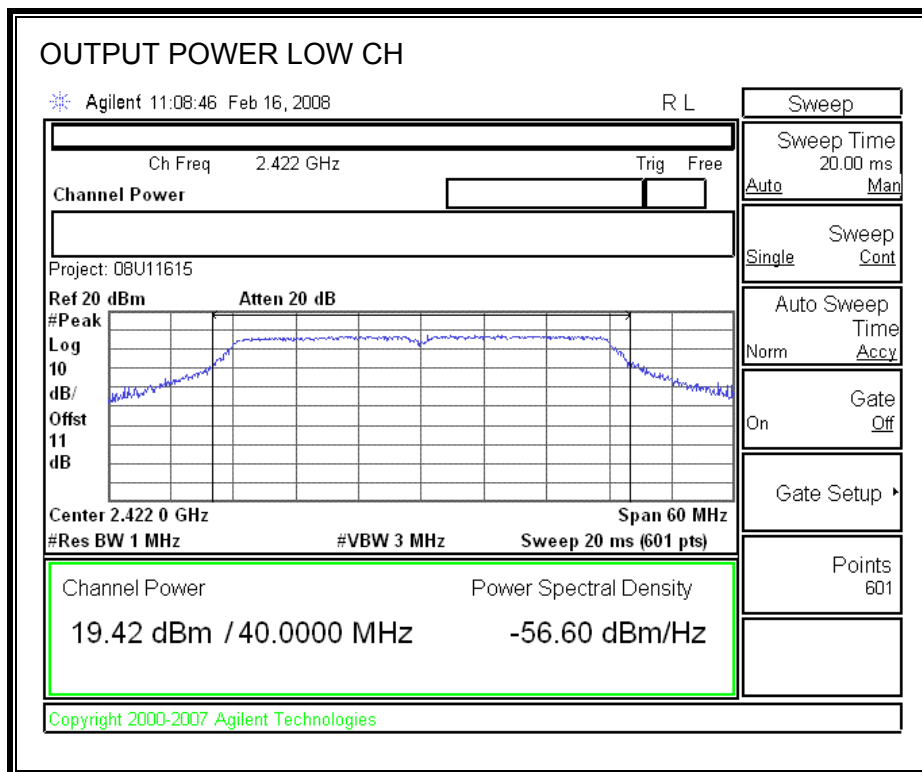
#### TEST PROCEDURE

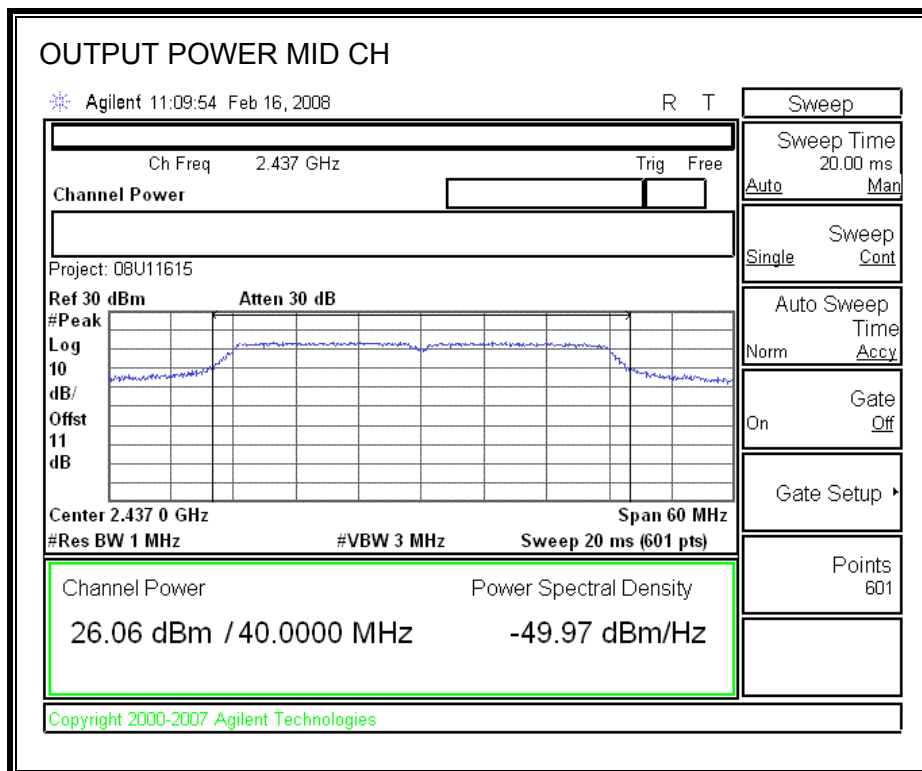
Peak power is measured using the spectrum analyzer's internal channel power integration function. Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.

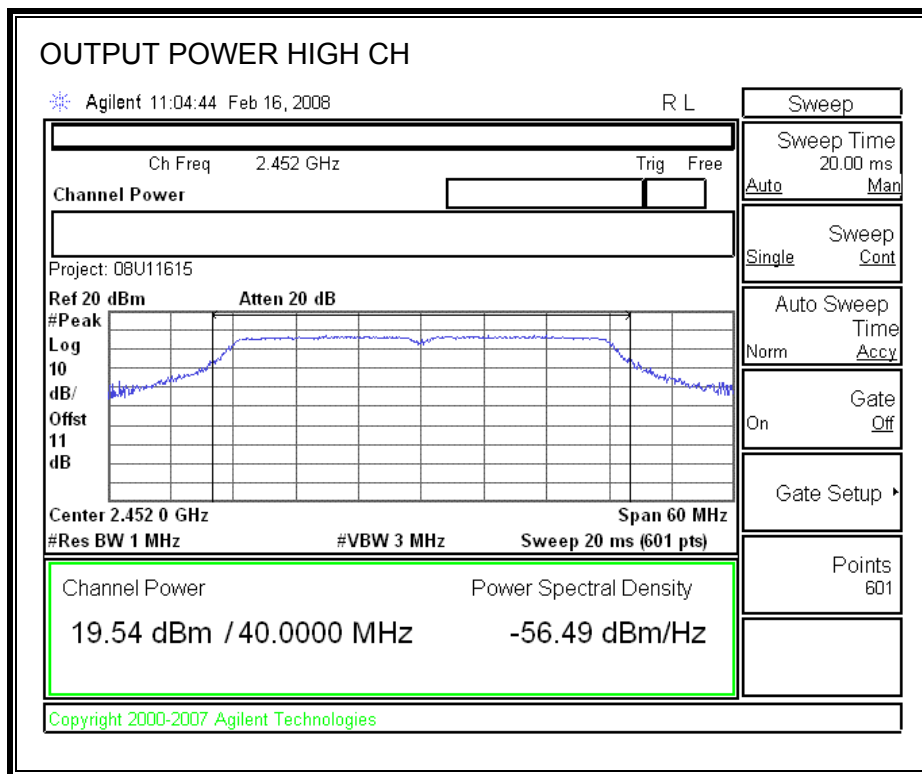
#### RESULTS

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2422	19.42	30.00	-10.58
Mid	2437	26.06	30.00	-3.94
High	2452	19.54	30.00	-10.46

## OUTPUT POWER







#### **7.4.4. 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 11dB (including 10 dB pad and 1dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2422	12.60
Middle	2437	19.10
High	2452	12.80



## 7.4.5. 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.

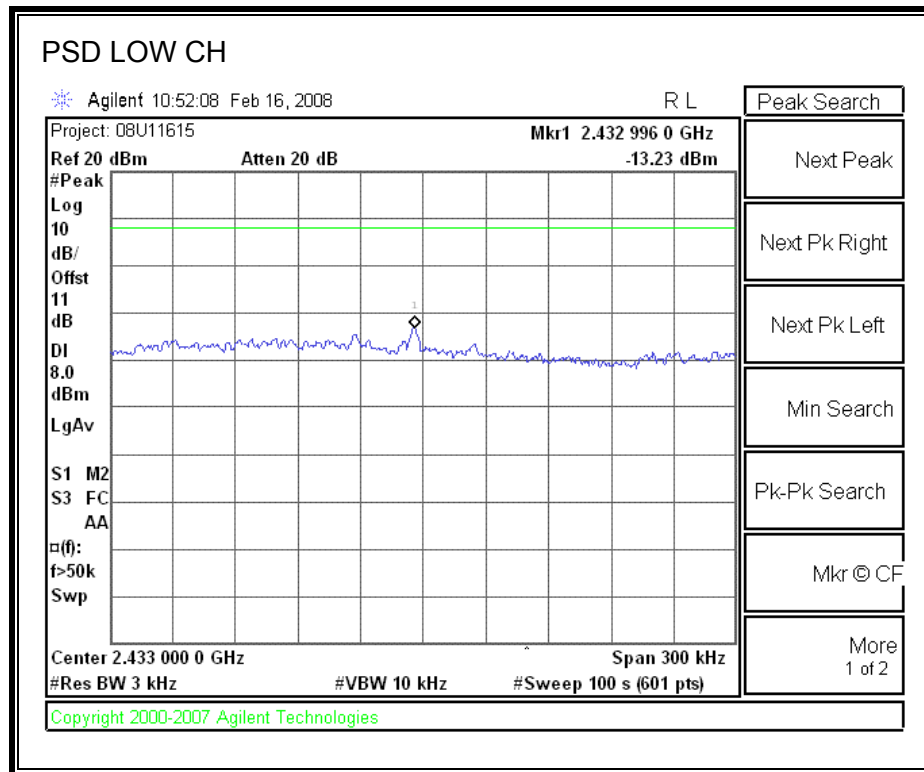
### TEST PROCEDURE

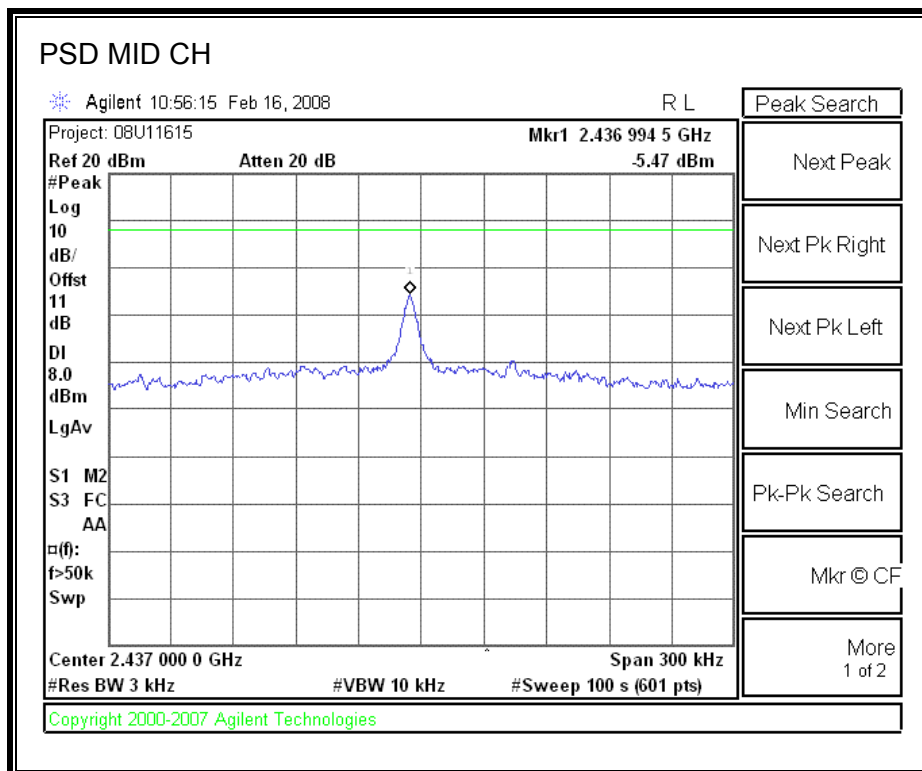
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

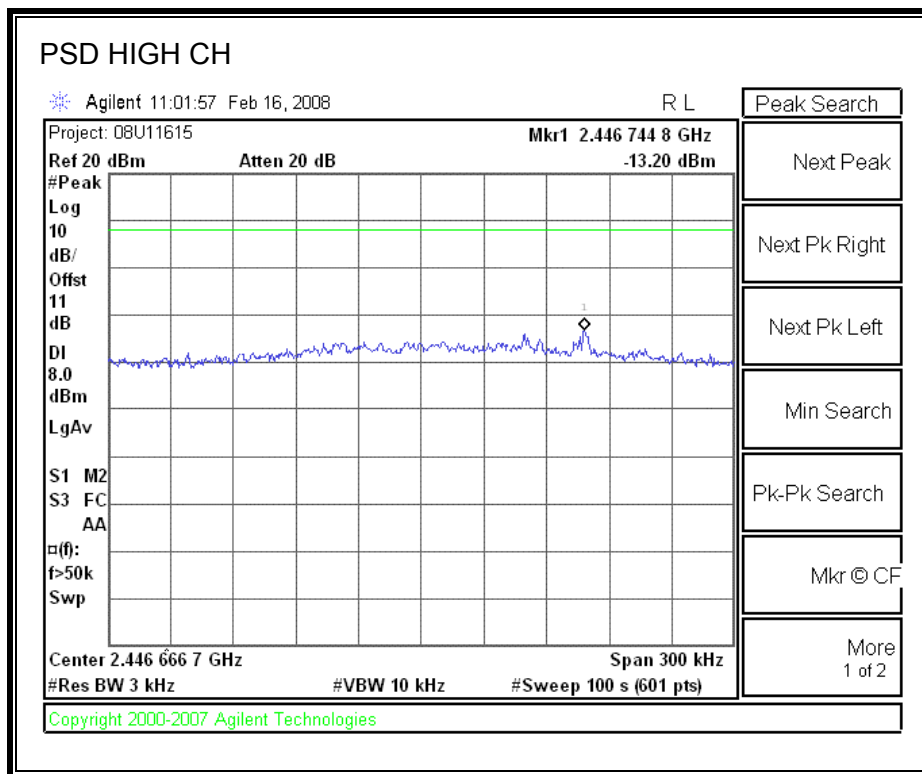
### RESULTS

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2422	-13.23	8	-21.23
Middle	2437	-5.47	8	-13.47
High	2452	-13.2	8	-21.20

**POWER SPECTRAL DENSITY**







## **7.4.6. 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.

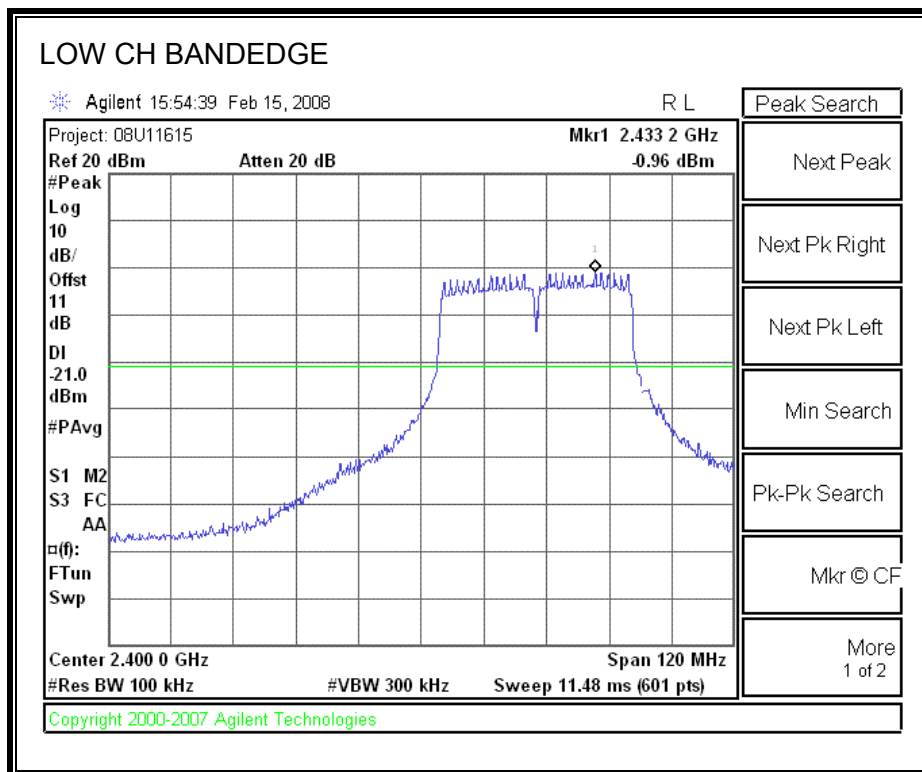
### **TEST PROCEDURE**

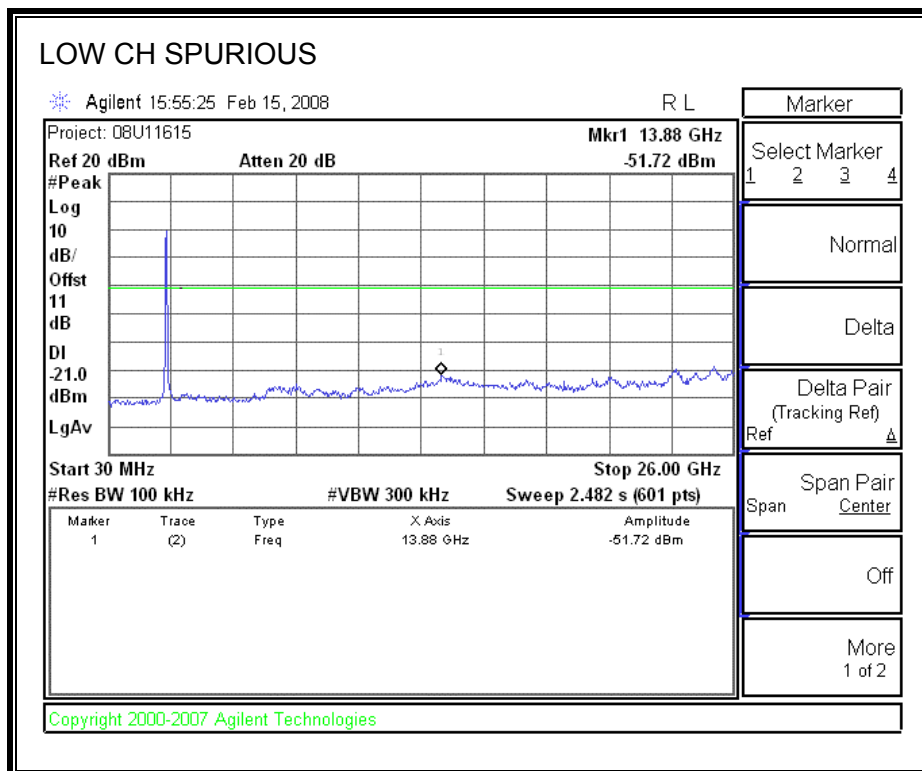
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

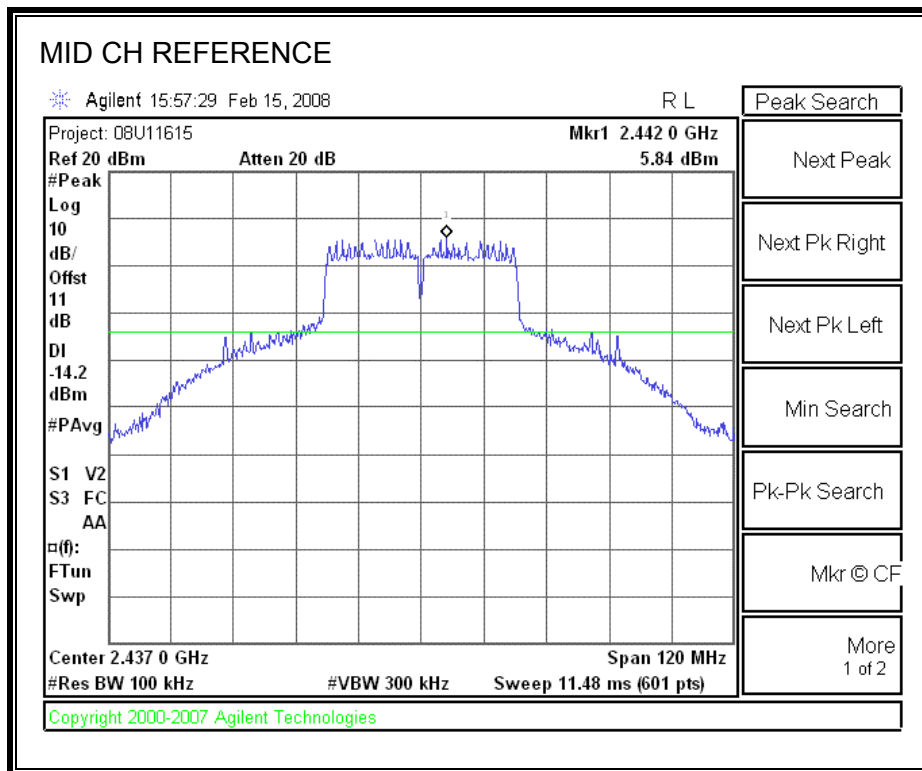
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

### **RESULTS**

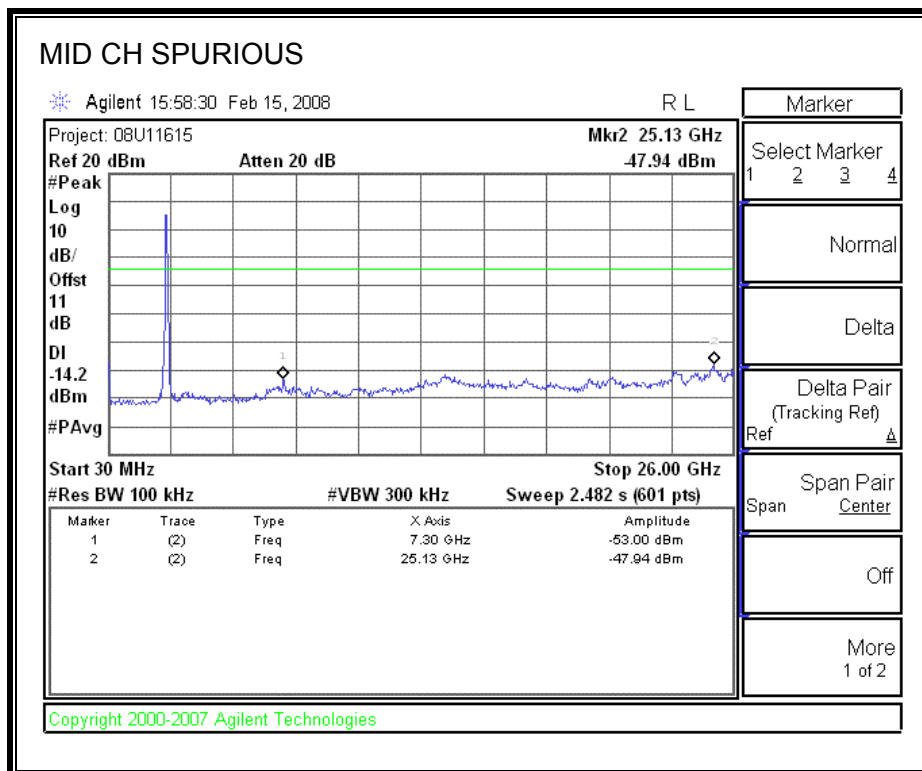
## SPURIOUS EMISSIONS

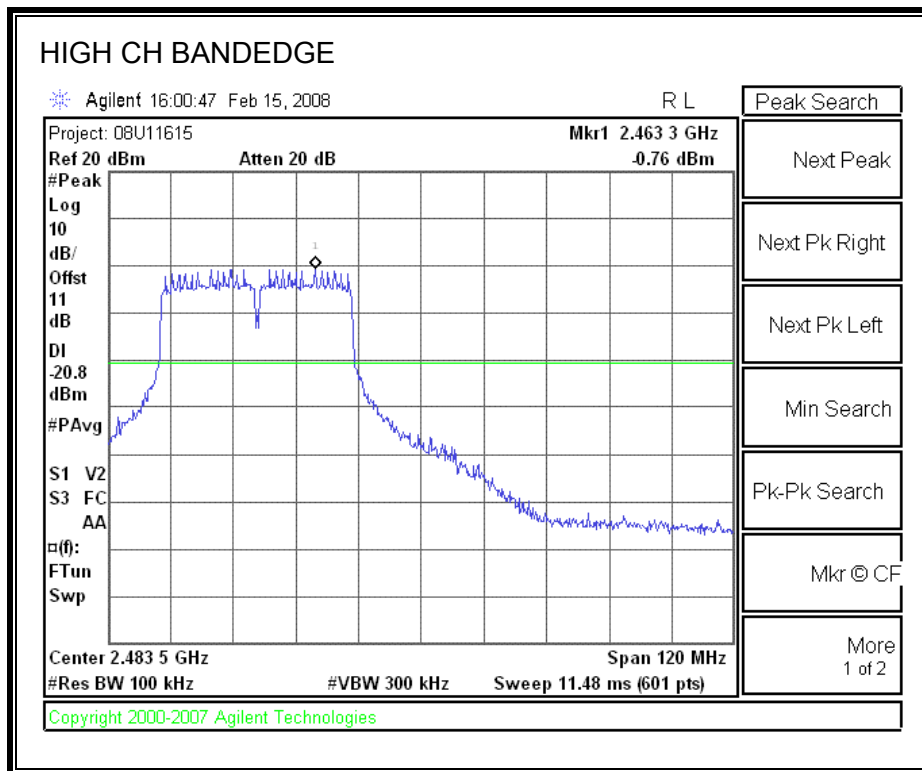


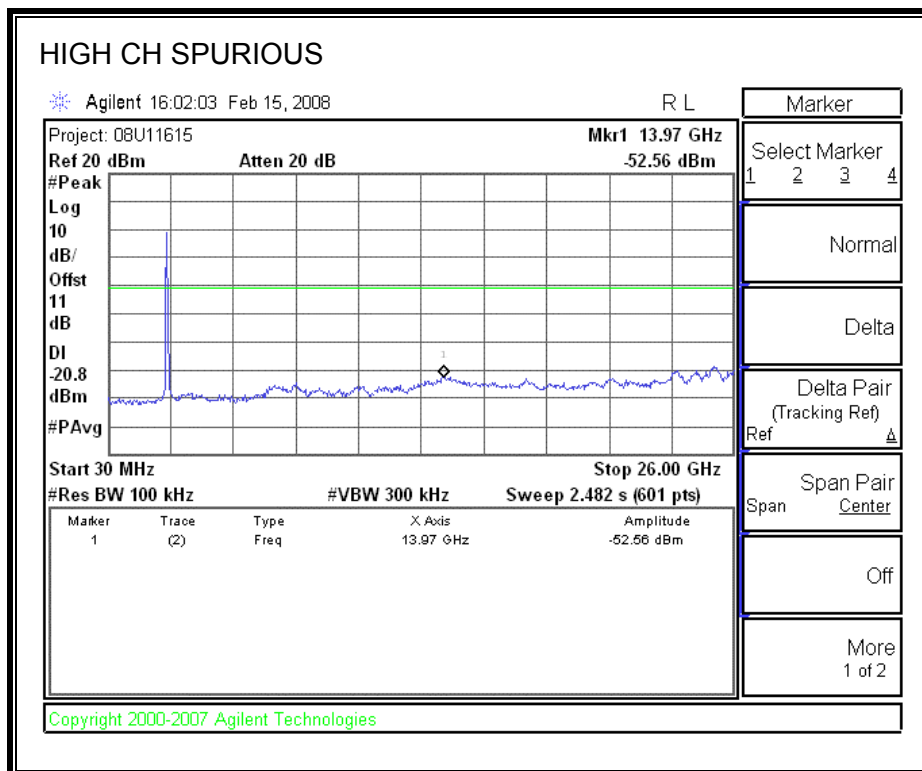












## 8. RADIATED TEST RESULTS

### 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.

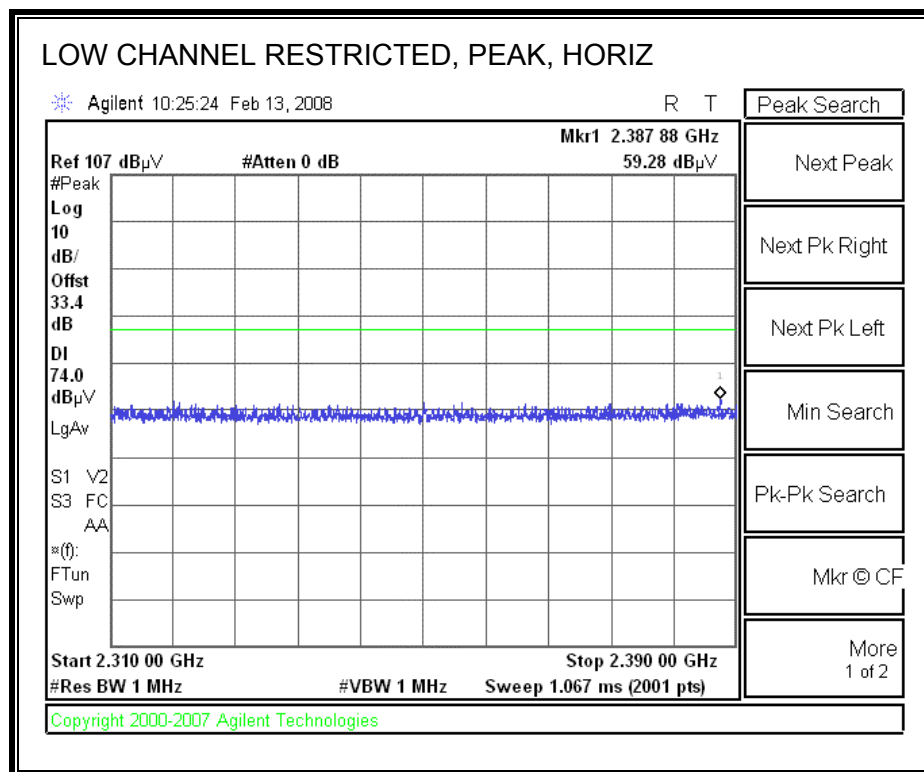
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

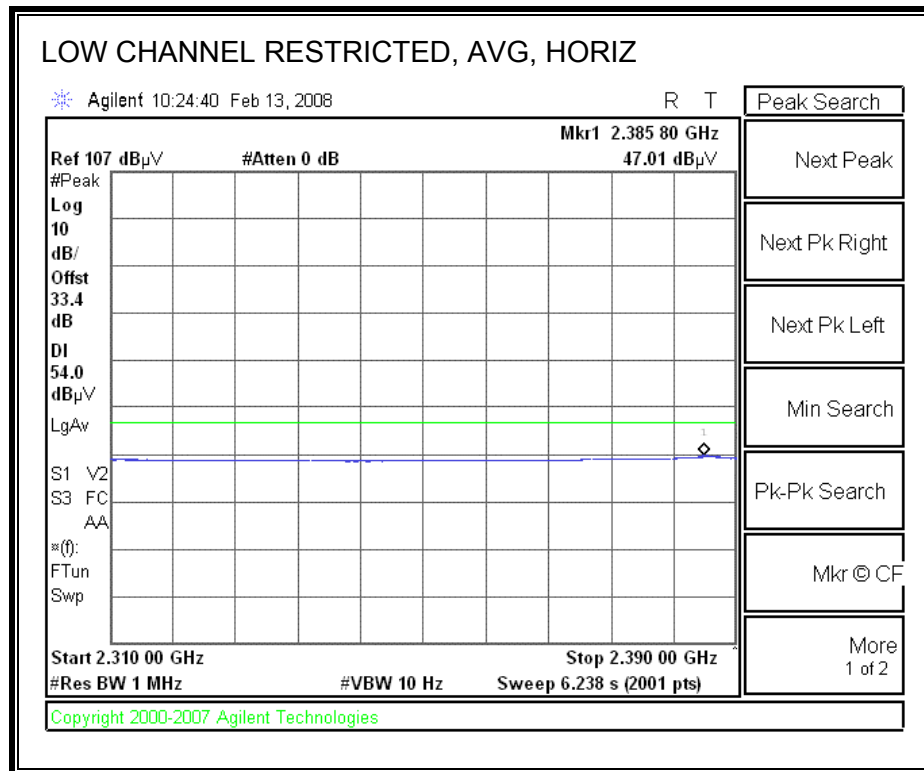
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

## 8.2. HALF LENGTH BOARD (150-S0423)

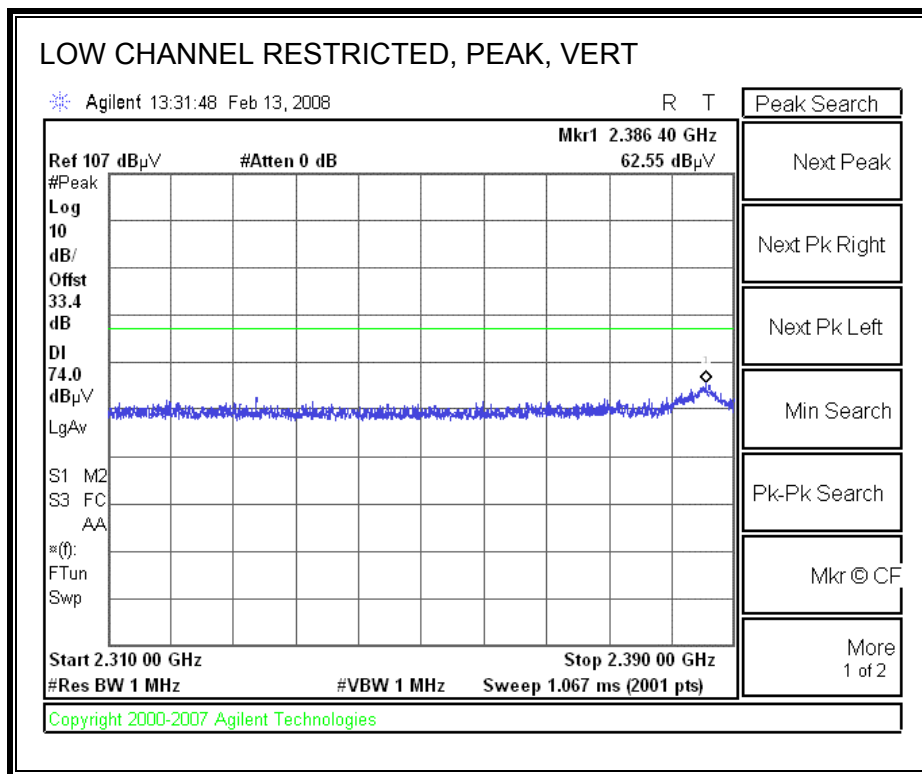
### 8.2.1. TRANSMITTER ABOVE 1 GHz FOR 802.11b MODE IN THE 2.4 GHz BAND

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

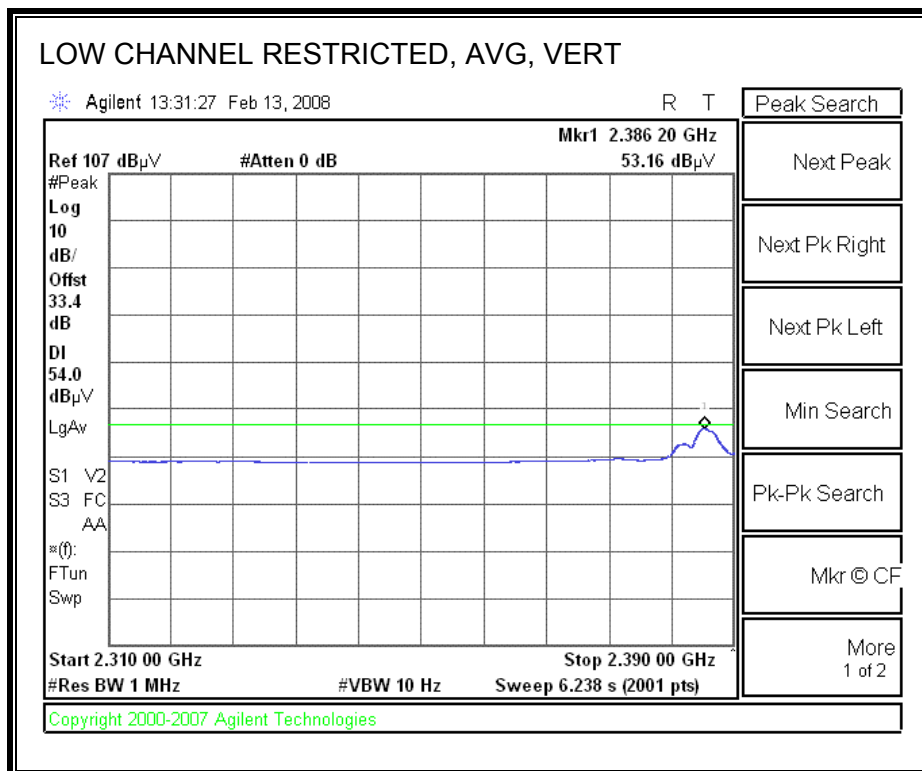




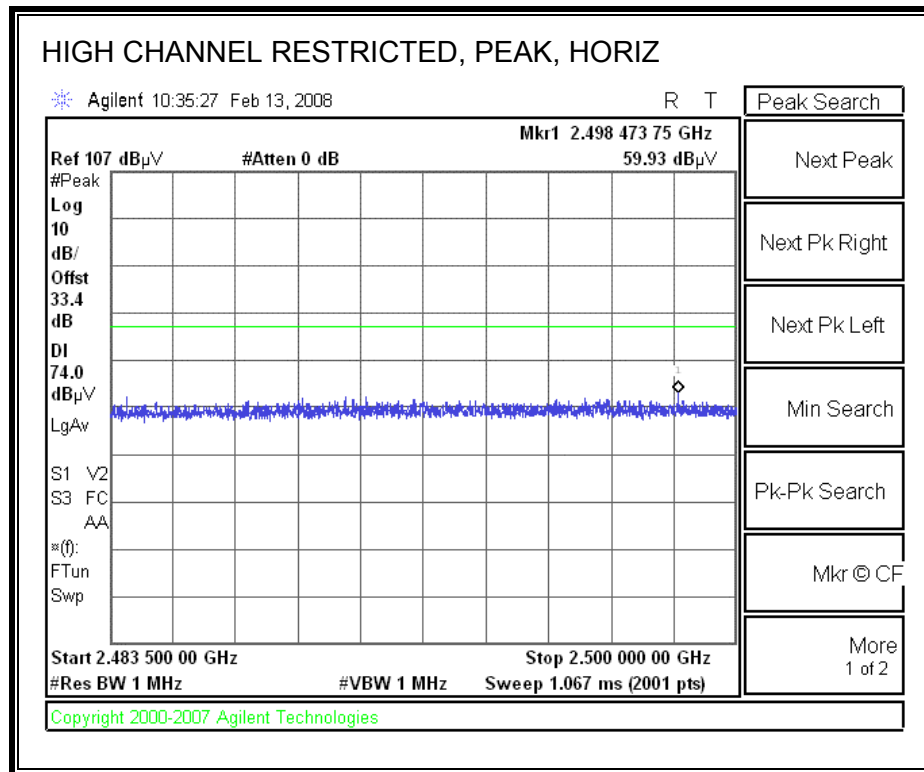
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**

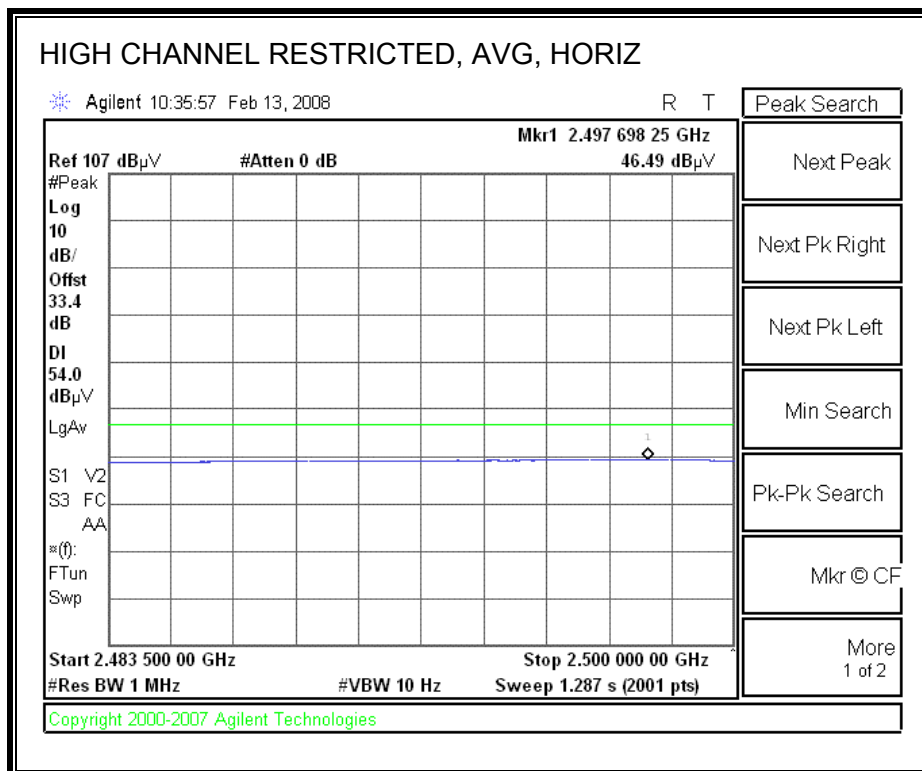




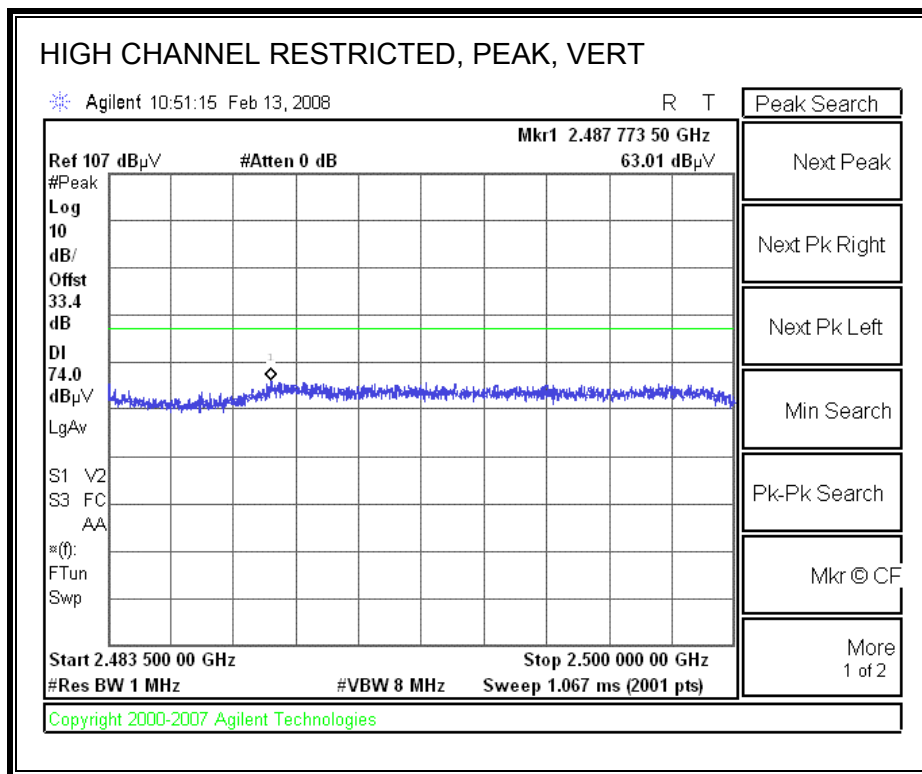


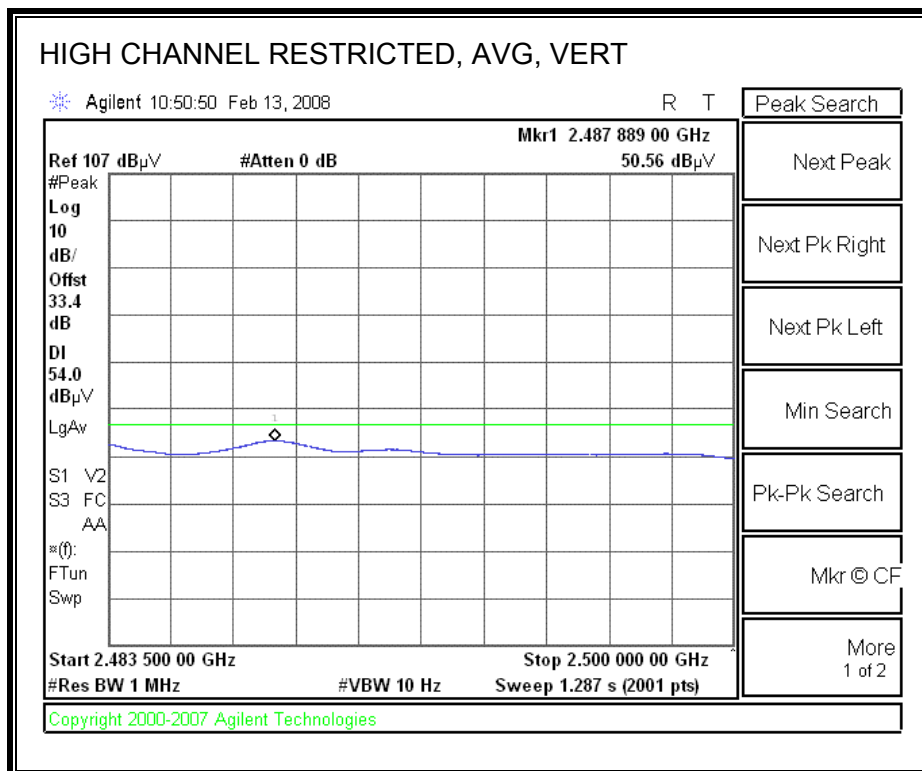
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





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



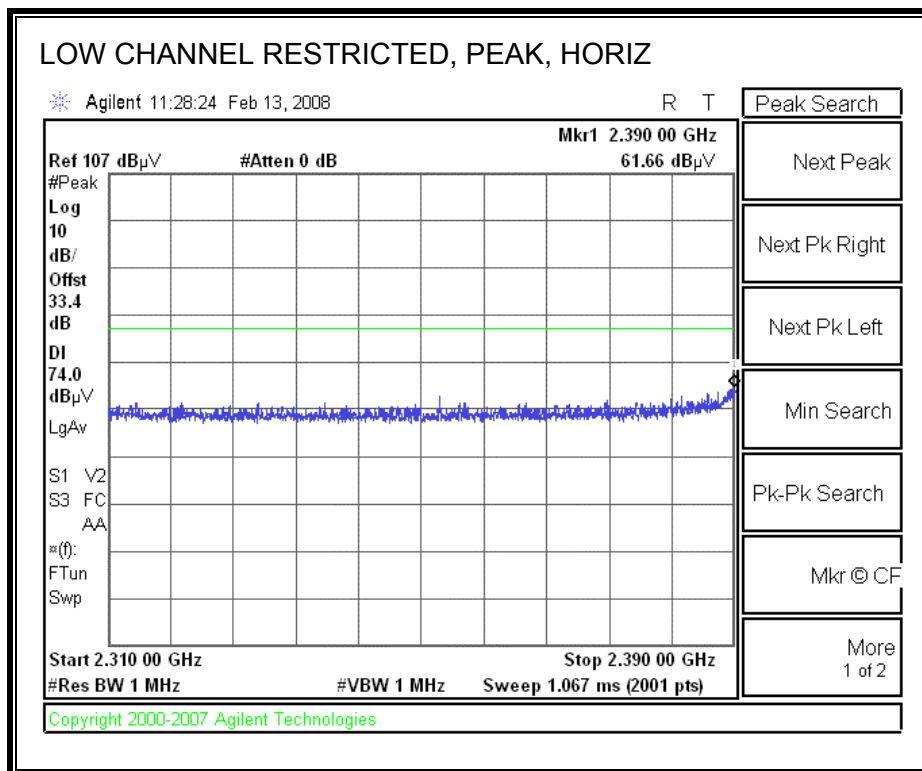


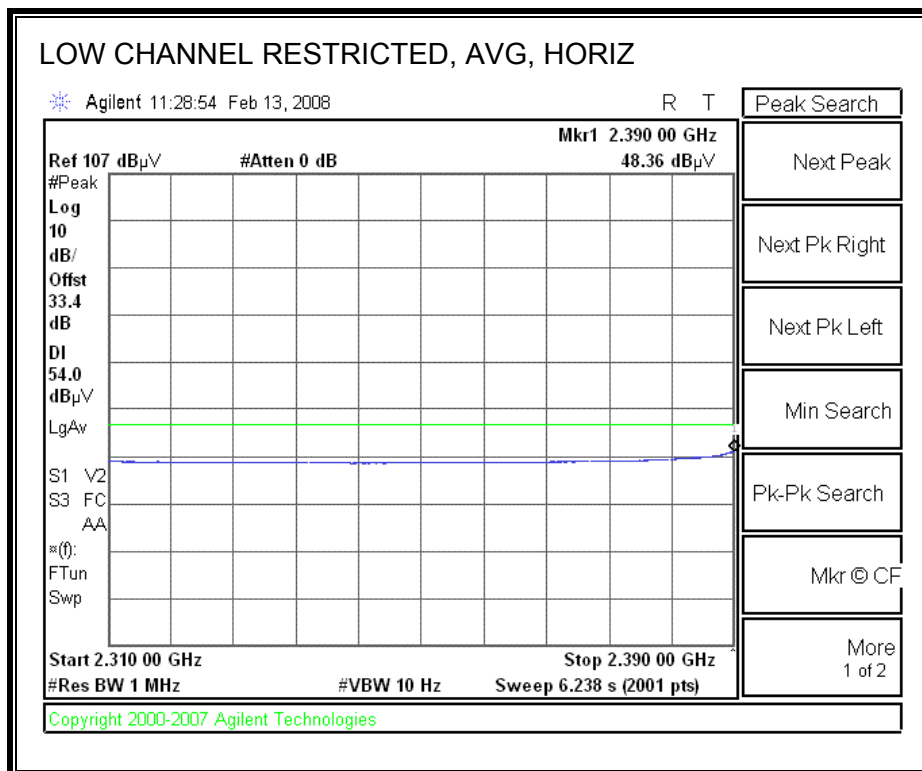
## HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement															
Compliance Certification Services, Fremont 5m Chamber															
Company: Atheros Project #: 08U11615 Date: 2/14/2008 Test Engineer: Chin Pang Configuration: EUT/Antenna/Laptop Mode: TX, b mode HB91-150-S0423															
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 15.209							
Hi Frequency Cables															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz, VBW=10Hz					
		Vien 187215002		C-5m Chamber				R_001							
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>															
3.216	3.0	45.7	34.0	31.1	0.4	-37.2	0.0	0.0	40.0	28.3	74	54	-34.0	-25.7	V
4.824	3.0	51.0	48.0	33.7	0.3	-36.5	0.0	0.0	48.6	45.6	74	54	-25.4	-8.4	V
3.216	3.0	44.6	33.1	31.1	0.4	-37.2	0.0	0.0	38.9	27.4	74	54	-35.1	-26.6	H
4.824	3.0	49.3	47.3	33.7	0.3	-36.5	0.0	0.0	46.9	44.9	74	54	-27.1	-9.1	H
<b>Mid Ch</b>															
3.249	3.0	46.6	34.8	31.2	0.4	-37.2	0.0	0.0	41.0	29.2	74	54	-33.0	-24.8	V
4.874	3.0	56.0	54.0	33.8	0.3	-36.5	0.0	0.0	53.7	51.7	74	54	-20.3	-2.3	V
7.311	3.0	56.5	52.0	36.2	0.9	-36.2	0.0	0.0	57.4	52.9	74	54	-16.6	-1.1	V
3.249	3.0	45.7	34.0	31.2	0.4	-37.2	0.0	0.0	40.1	28.4	74	54	-33.9	-25.6	H
4.874	3.0	47.5	45.3	33.8	0.3	-36.5	0.0	0.0	45.2	43.0	74	54	-28.8	-11.0	H
7.311	3.0	46.4	41.0	36.2	0.9	-36.2	0.0	0.0	47.3	41.9	74	54	-26.7	-12.1	H
<b>High Ch</b>															
3.283	3.0	45.0	33.6	31.3	0.3	-37.1	0.0	0.0	39.5	28.1	74	54	-34.5	-25.9	V
4.924	3.0	52.0	48.0	33.9	0.4	-36.5	0.0	0.0	49.8	45.8	74	54	-24.2	-8.2	V
7.386	3.0	52.0	40.0	36.3	0.9	-36.2	0.0	0.0	53.0	41.0	74	54	-21.0	-13.0	V
3.283	3.0	44.2	33.0	31.3	0.3	-37.1	0.0	0.0	38.7	27.5	74	54	-35.3	-26.5	H
4.924	3.0	50.5	46.0	33.9	0.4	-36.5	0.0	0.0	48.3	43.8	74	54	-25.7	-10.2	H
7.386	3.0	47.0	36.0	36.3	0.9	-36.2	0.0	0.0	48.0	37.0	74	54	-26.0	-17.0	H
Rev. 4127															
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 IN THE 2.4 GHz BAND

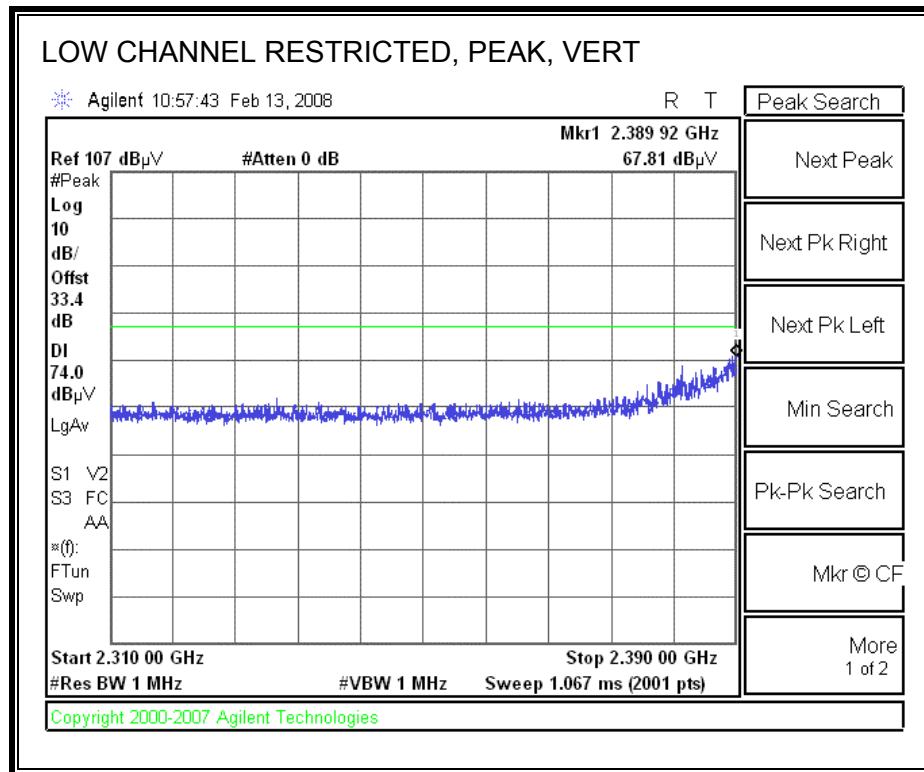
### RESTRICTED BANEDGE (LOW CHANNEL, HORIZONTAL)

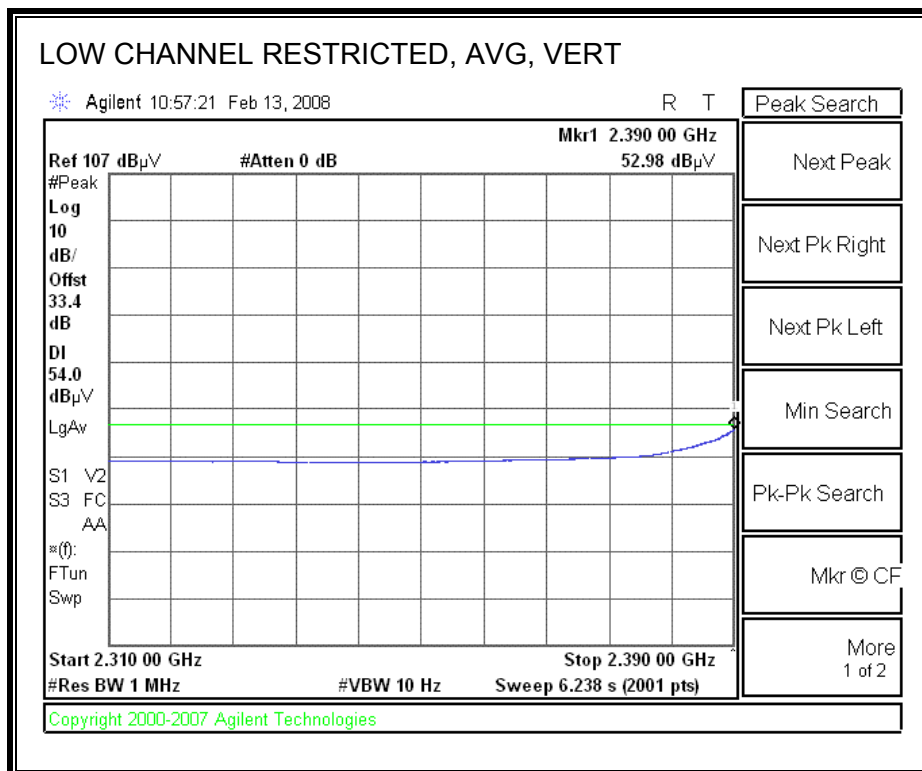




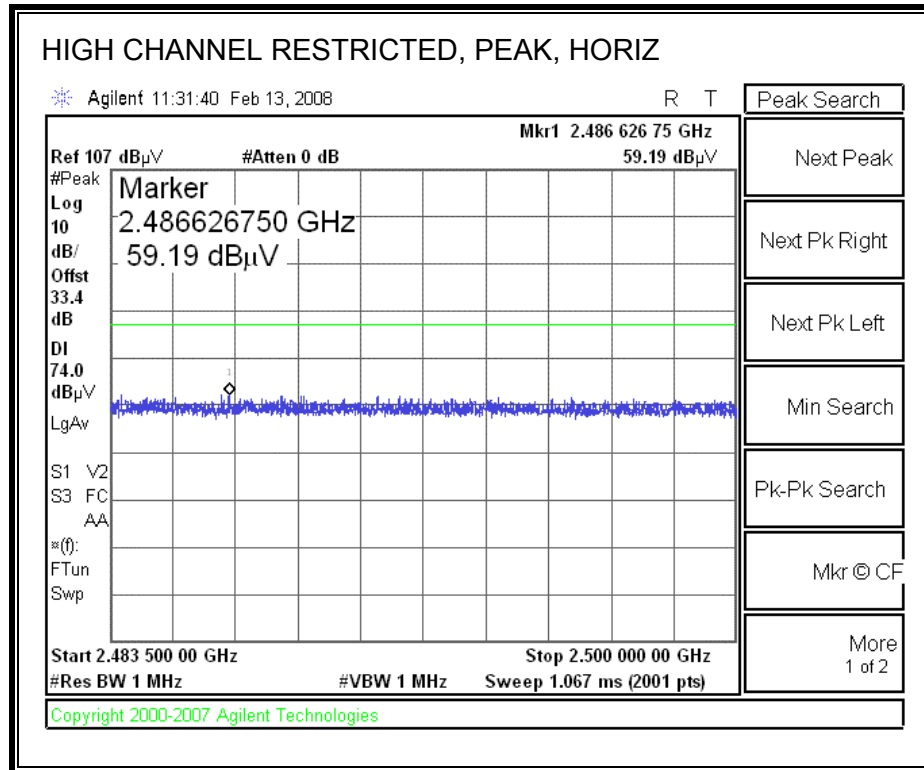


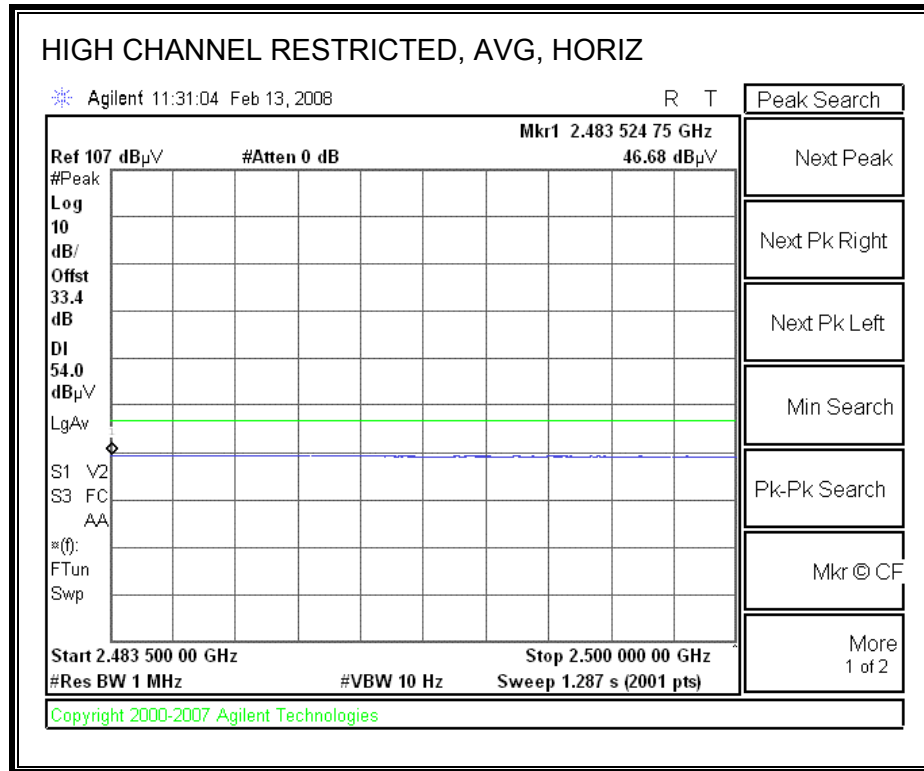
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**



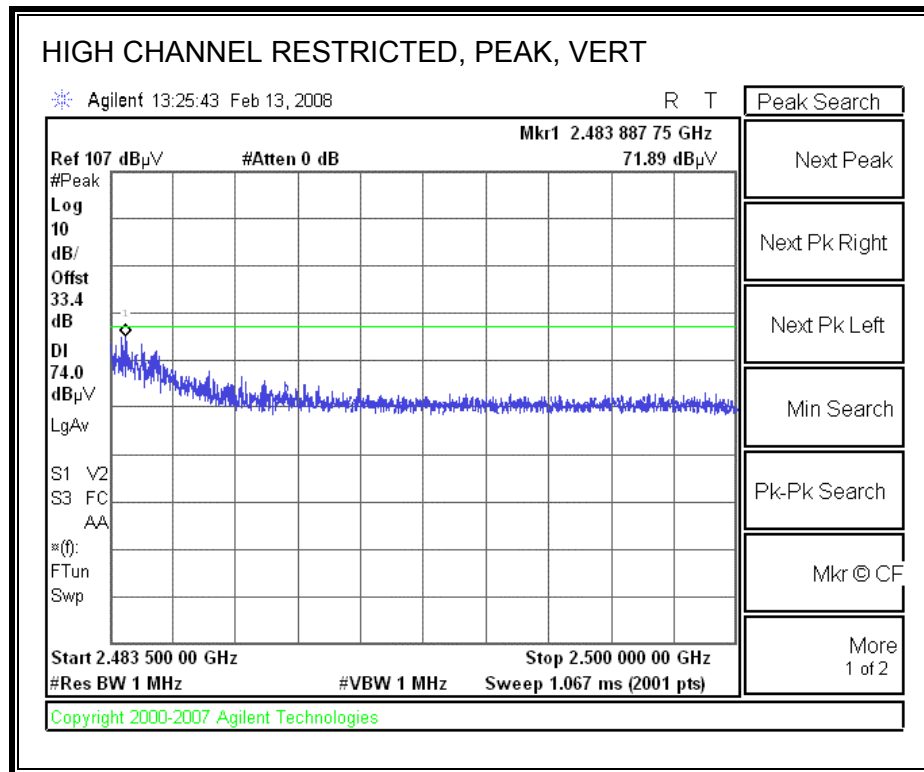


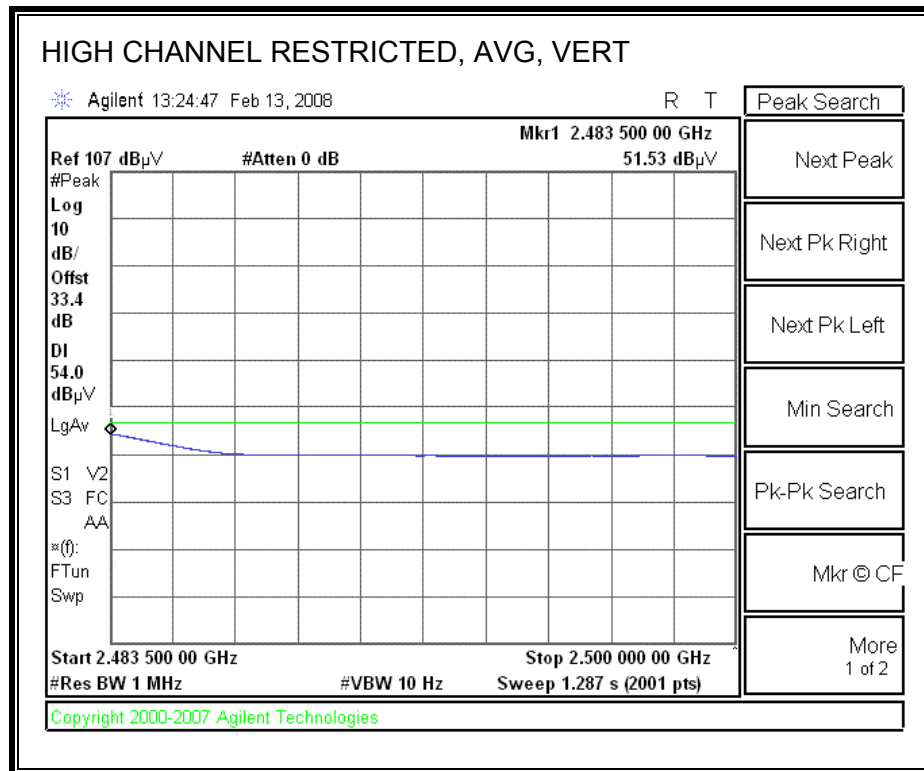
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





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



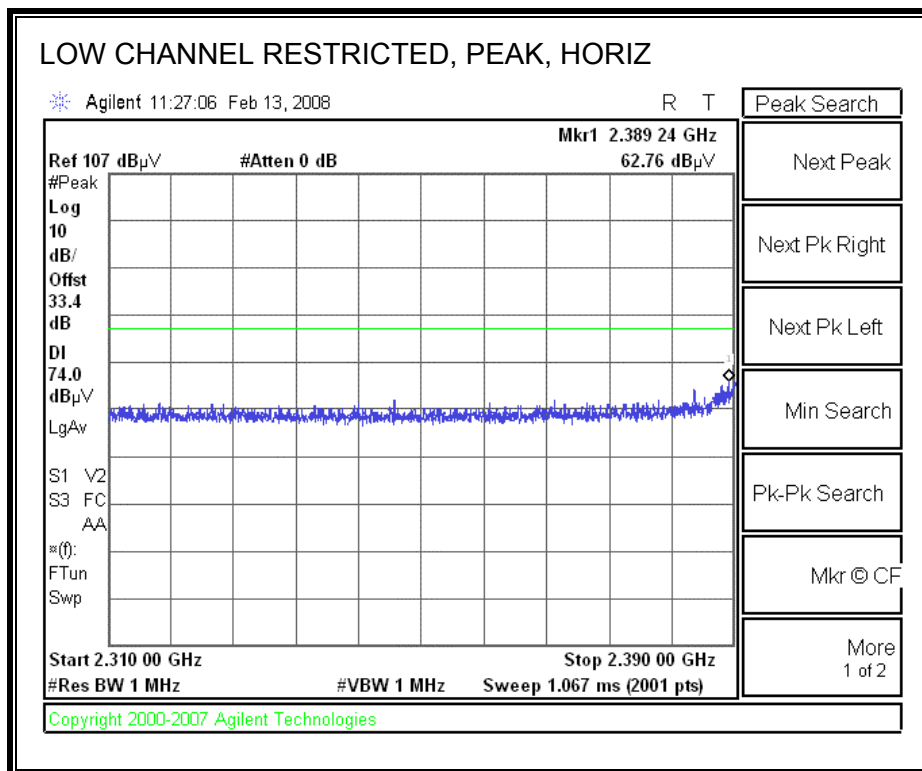


## HARMONICS AND SPURIOUS EMISSIONS

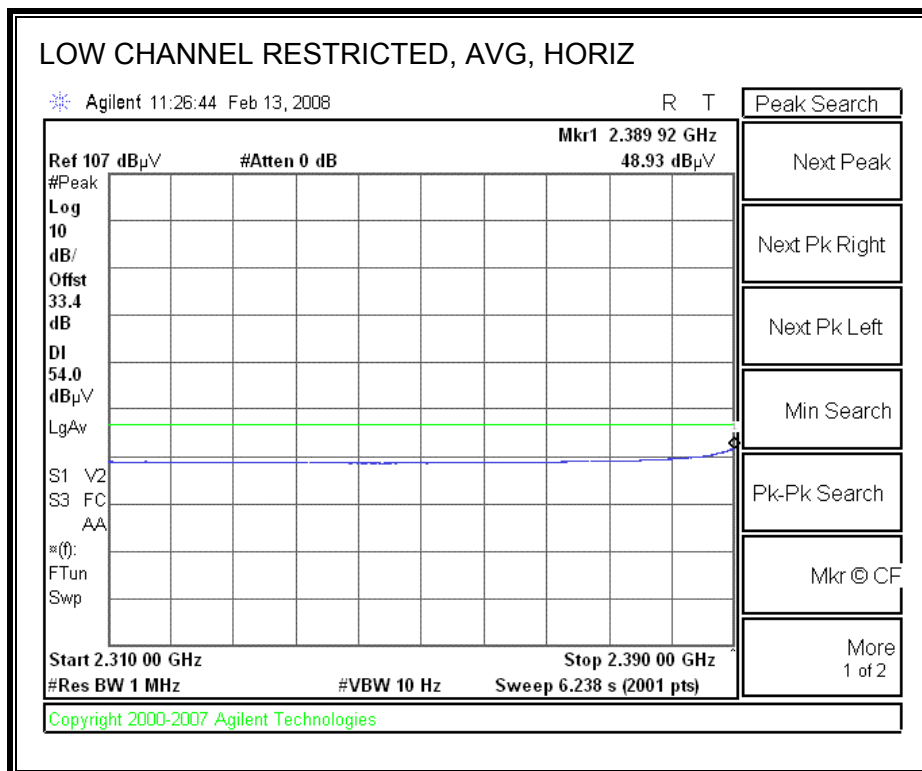
High Frequency Measurement															
Compliance Certification Services, Fremont 5m Chamber															
Company: Atheros Project #: 08U11615 Date: 2/14/2008 Test Engineer: Chin Pang Configuration: EUT/Antenna/Laptop Mode: TX, g mode HB91-150-S0423															
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T73; S/N: 6717 @3m		T144 Miteq 3008A00931						FCC 15.209							
Hi Frequency Cables															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz, VBW=10Hz					
		Vien 187215002		C-5m Chamber				R_001							
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fldr 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>															
3.216	3.0	47.0	33.5	31.1	0.4	-37.2	0.0	0.0	41.3	27.8	74	54	-32.7	-26.2	V
4.824	3.0	50.5	37.6	33.7	0.3	-36.5	0.0	0.0	48.1	35.2	74	54	-25.9	-18.8	V
<b>Mid Ch</b>															
3.249	3.0	48.3	35.0	31.2	0.4	-37.2	0.0	0.0	42.7	29.4	74	54	-31.3	-24.6	V
4.874	3.0	55.7	41.0	33.8	0.3	-36.5	0.0	0.0	53.4	38.7	74	54	-20.6	-15.3	V
7.311	3.0	61.5	49.8	36.2	0.9	-36.2	0.0	0.0	62.4	50.7	74	54	-11.6	-3.3	V
<b>High Ch</b>															
3.283	3.0	46.0	33.4	31.3	0.3	-37.1	0.0	0.0	40.5	27.9	74	54	-33.5	-26.1	V
4.924	3.0	50.2	35.0	33.9	0.4	-36.5	0.0	0.0	48.0	32.8	74	54	-26.0	-21.2	V
7.386	3.0	59.0	47.8	36.3	0.9	-36.2	0.0	0.0	60.0	48.8	74	54	-14.0	-5.2	V
Rev. 4.12.7															
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										

### 8.2.3. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 2.4 GHz BAND

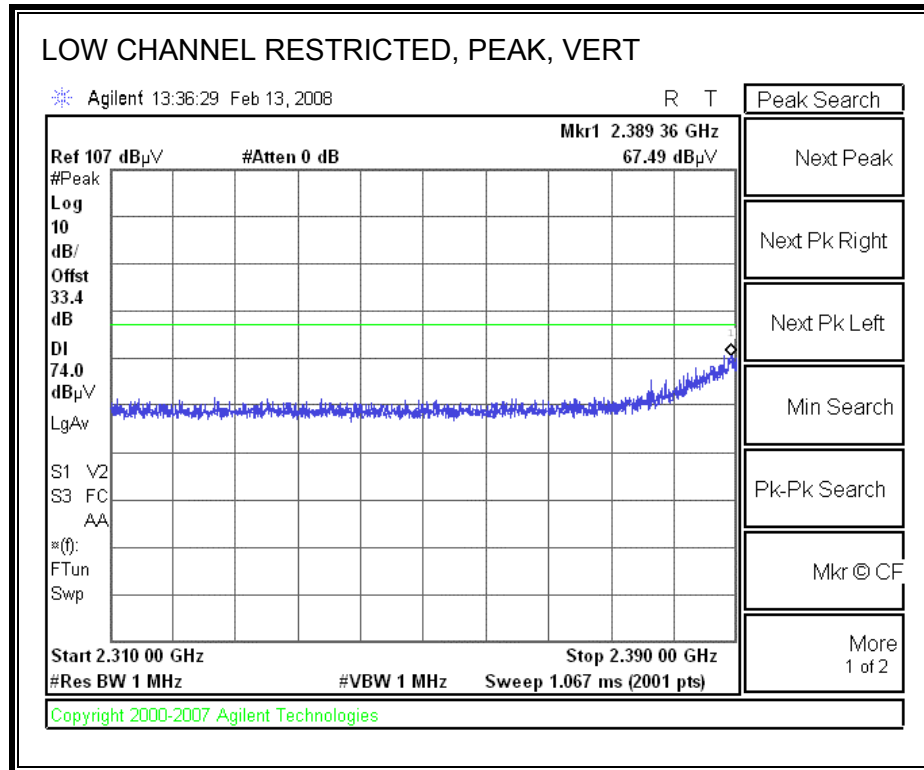
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

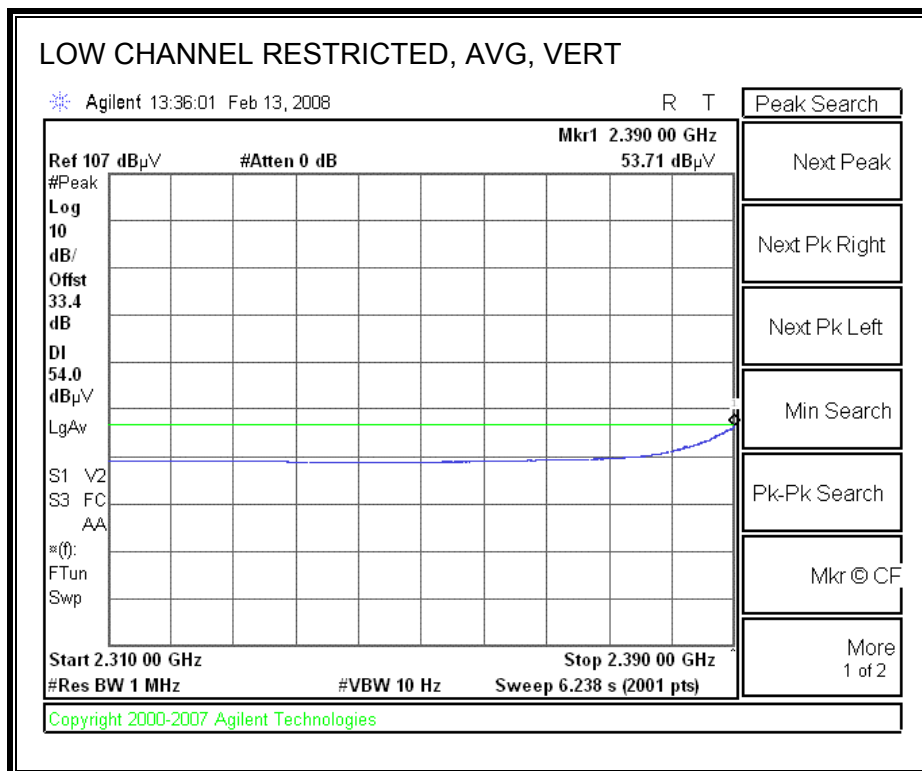




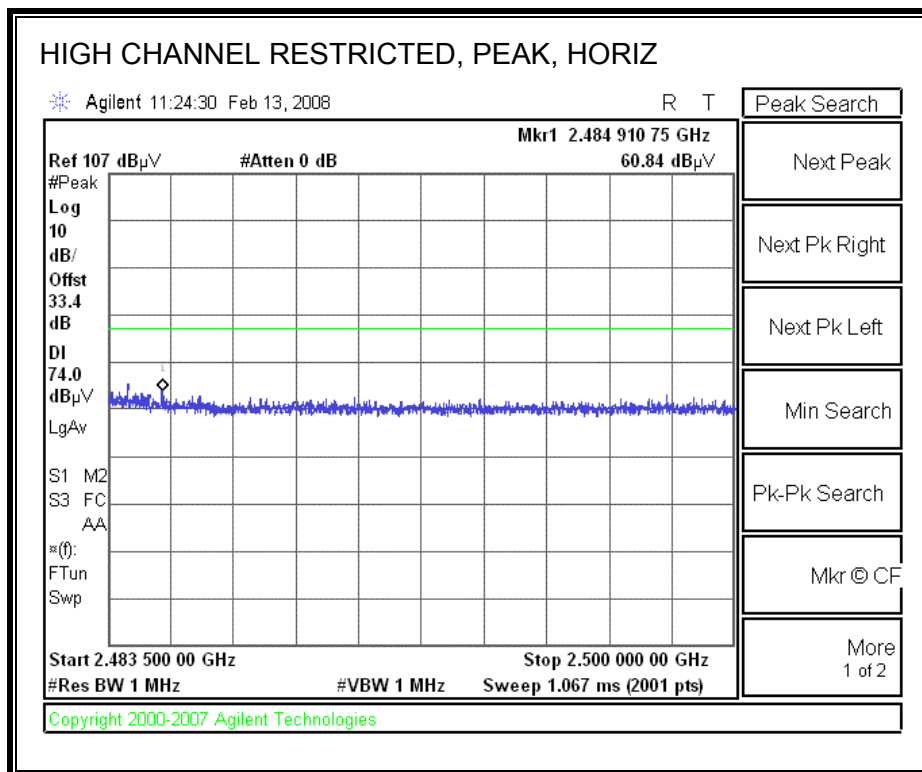


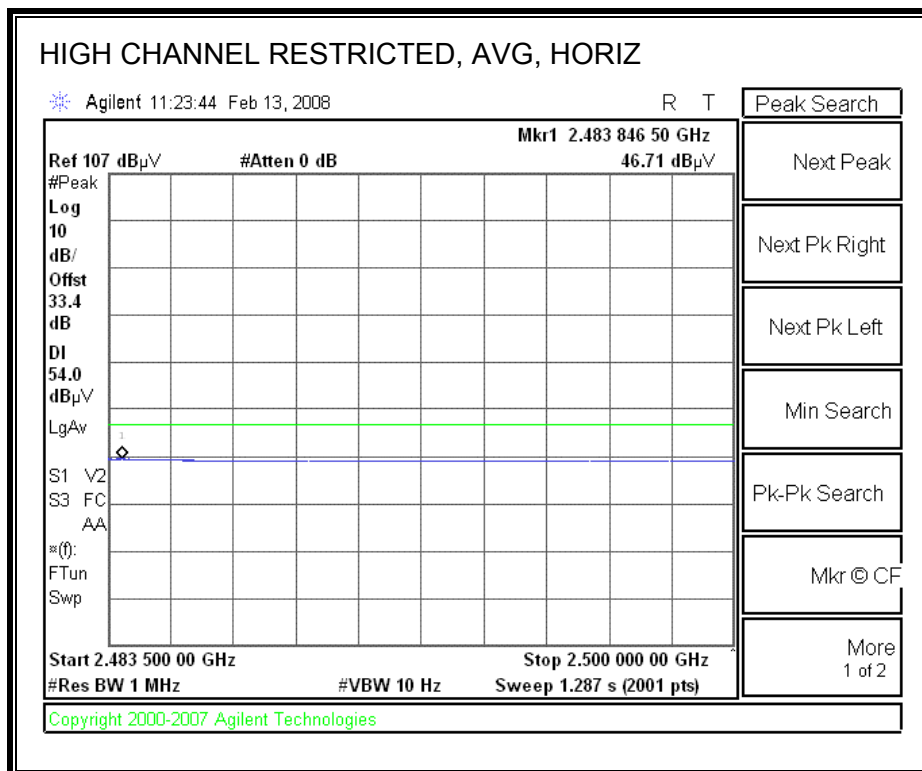
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**



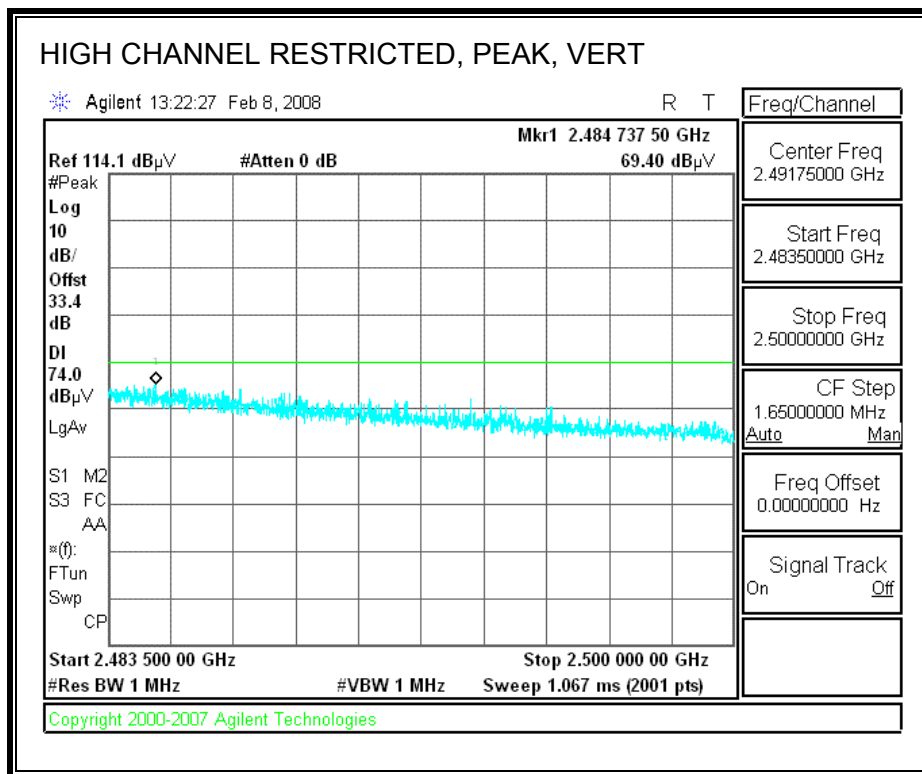


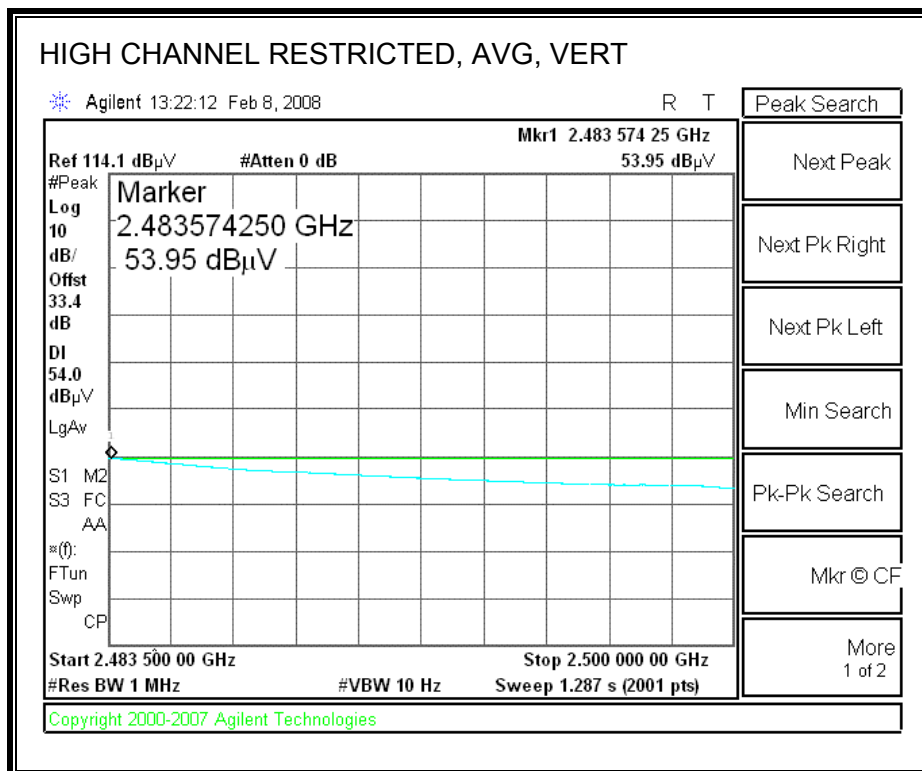
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





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





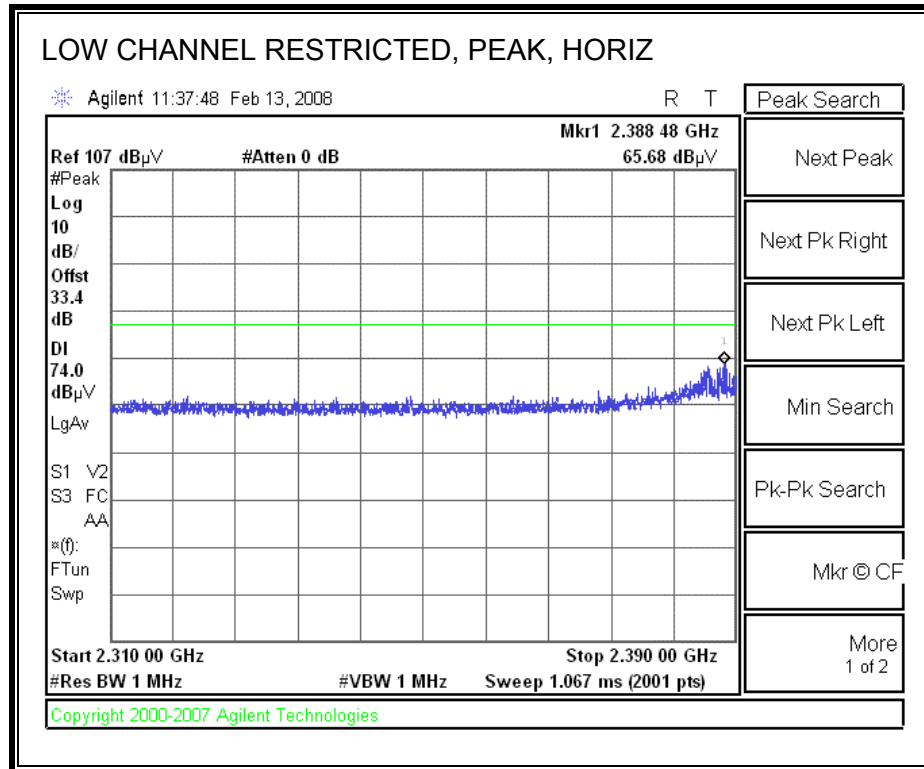
## HARMONICS AND SPURIOUS EMISSIONS

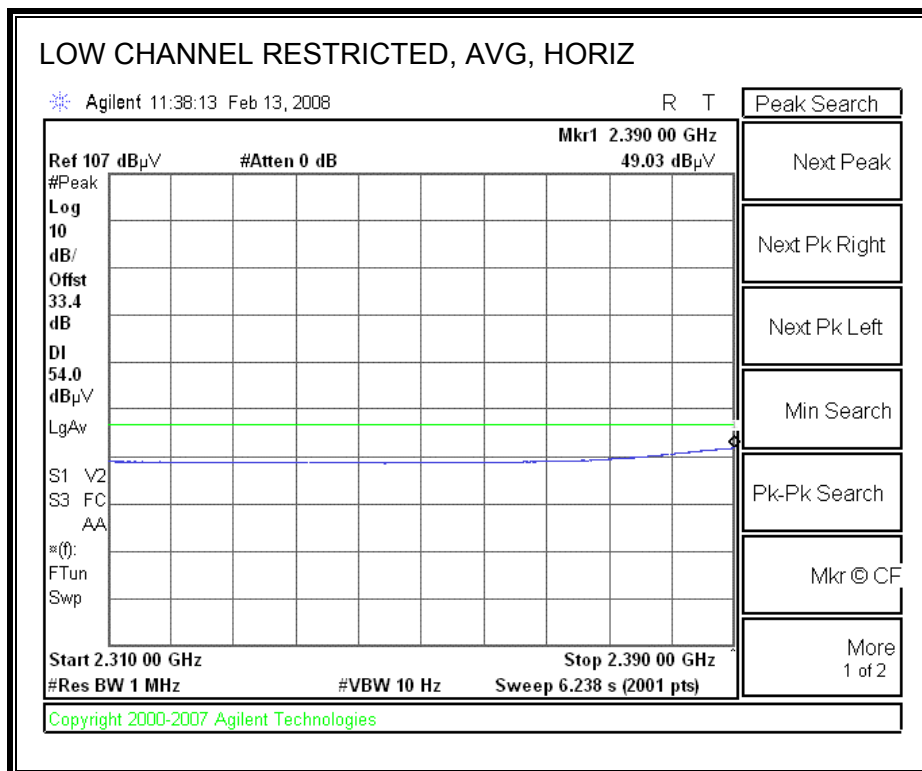
High Frequency Measurement															
Compliance Certification Services, Fremont 5m Chamber															
Company: Atheros Project #: 08U11615 Date: 2/14/2008 Test Engineer: Chin Pang Configuration: EUT/Antenna/Laptop Mode: TX, HT20 mode HB91-150-S0423															
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T73; S/N: 6717 @3m		T144 Miteq 3008A00931						FCC 15.209							
Hi Frequency Cables															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz, VBW=10Hz					
		Vien 187215002		C-5m Chamber				R_001							
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>															
3.216	3.0	46.6	33.4	31.1	0.4	-37.2	0.0	0.0	40.9	27.7	74	54	-33.1	-26.3	V
4.824	3.0	49.6	36.5	33.7	0.3	-36.5	0.0	0.0	47.2	34.1	74	54	-26.8	-19.9	V
<b>Mid Ch</b>															
3.249	3.0	48.3	35.0	31.2	0.4	-37.2	0.0	0.0	42.7	29.4	74	54	-31.3	-24.6	V
4.874	3.0	52.0	40.0	33.8	0.3	-36.5	0.0	0.0	49.7	37.7	74	54	-24.3	-16.3	V
7.311	3.0	62.0	50.6	36.2	0.9	-36.2	0.0	0.0	62.9	51.5	74	54	-11.1	-2.5	V
<b>High Ch</b>															
3.283	3.0	46.6	33.3	31.3	0.3	-37.1	0.0	0.0	41.1	27.8	74	54	-32.9	-26.2	V
4.924	3.0	52.5	37.8	33.9	0.4	-36.5	0.0	0.0	50.3	35.6	74	54	-23.7	-18.4	V
7.386	3.0	61.0	48.7	36.3	0.9	-36.2	0.0	0.0	62.0	49.7	74	54	-12.0	-4.3	V
Rev. 4127															
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											



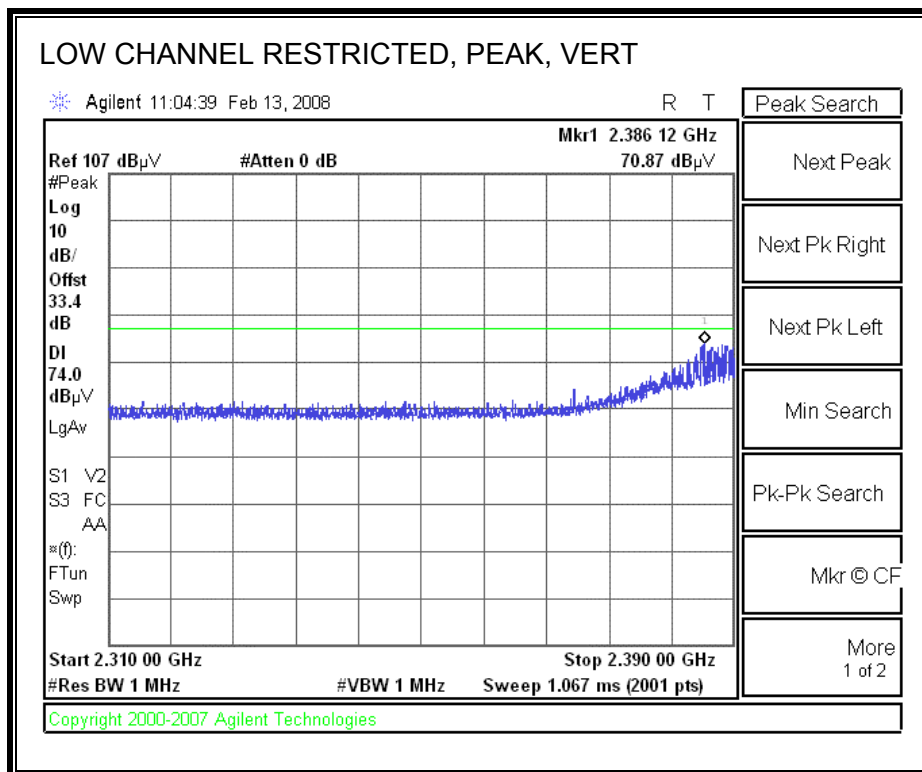
## 8.2.4. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE 2.4 GHz BAND

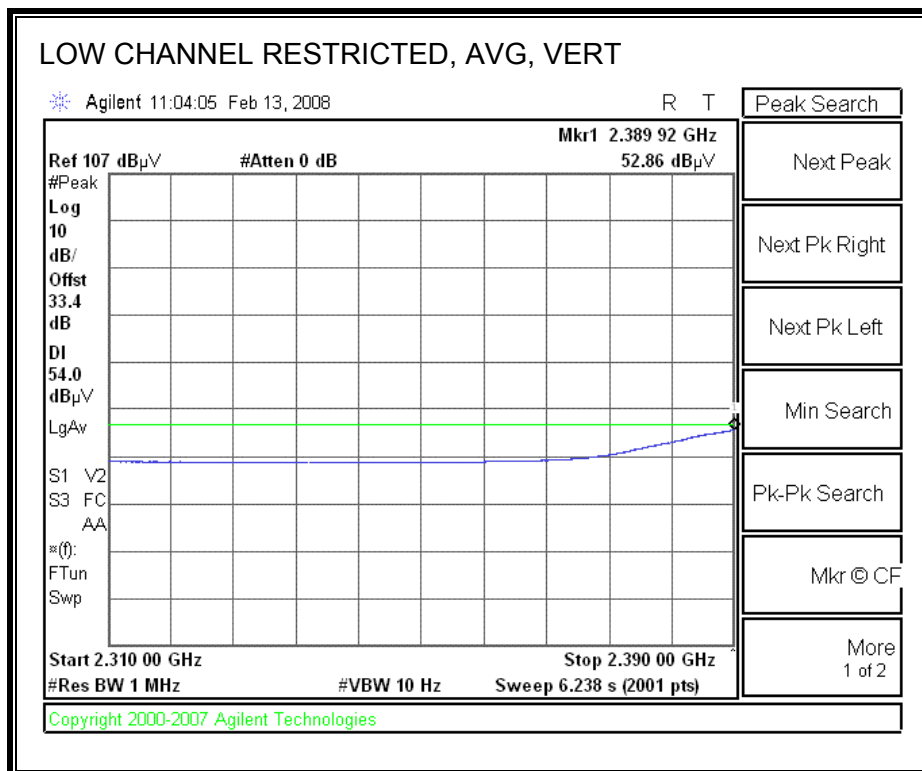
### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



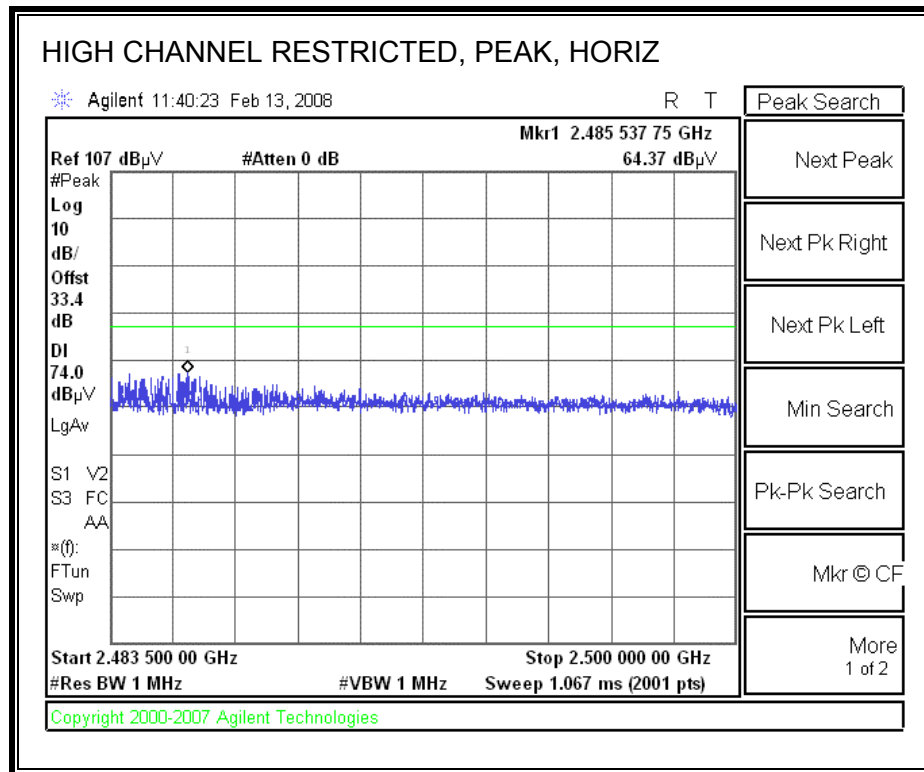


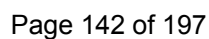
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**



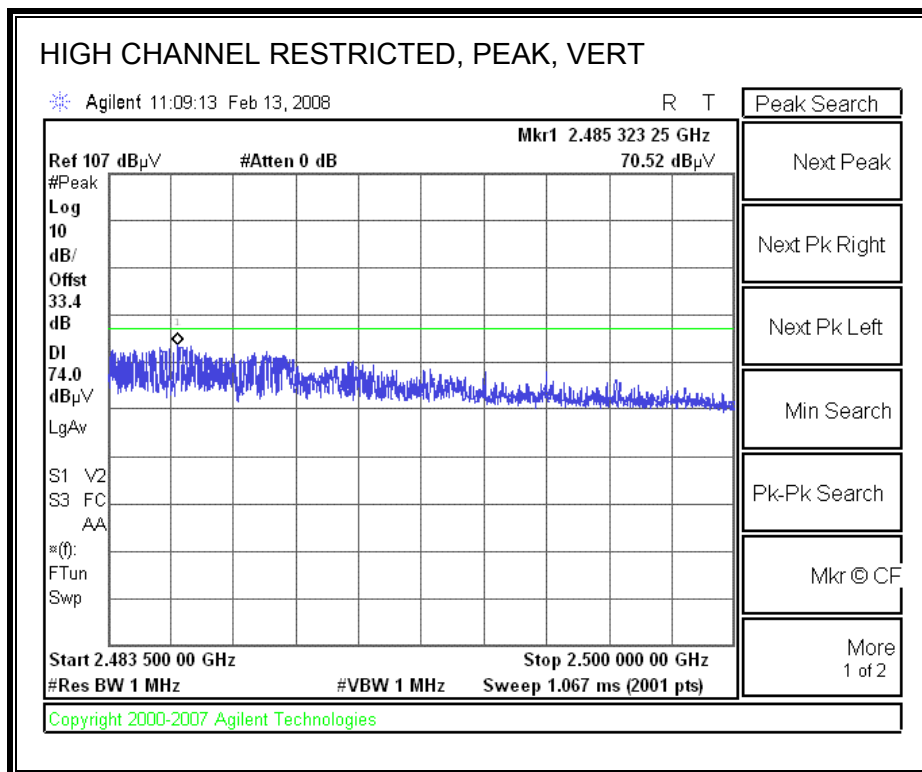


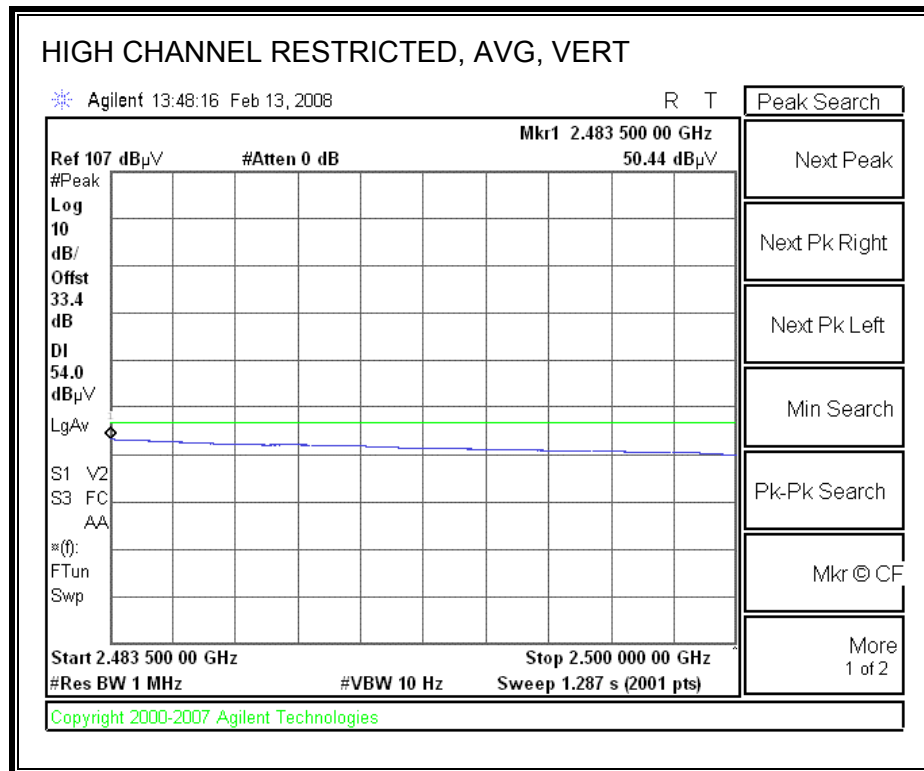
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





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







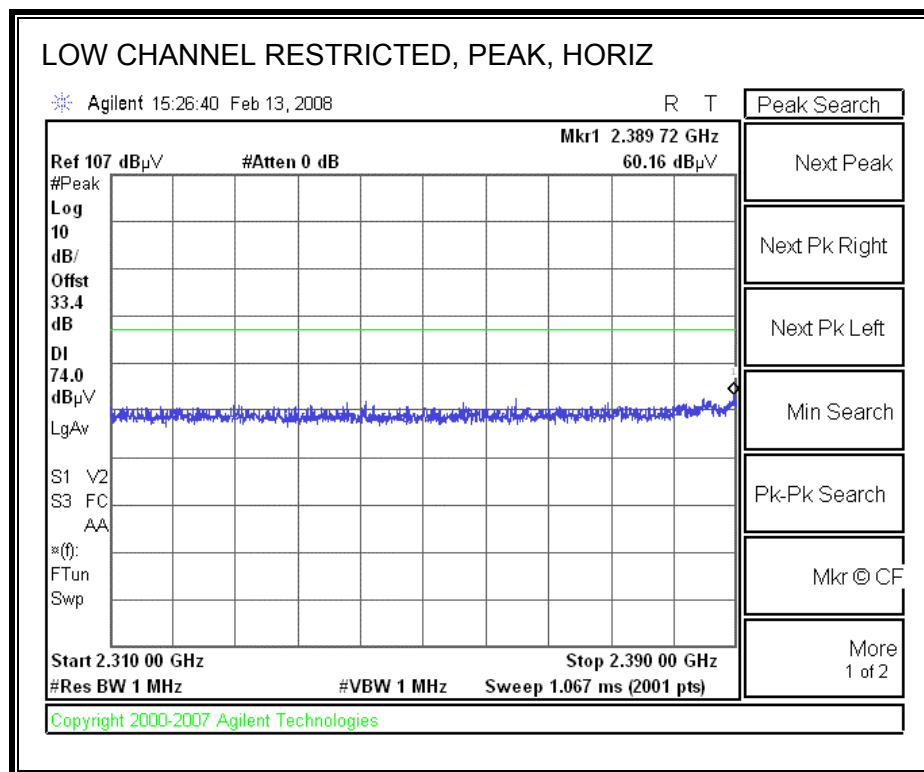
## HARMONICS AND SPURIOUS EMISSIONS

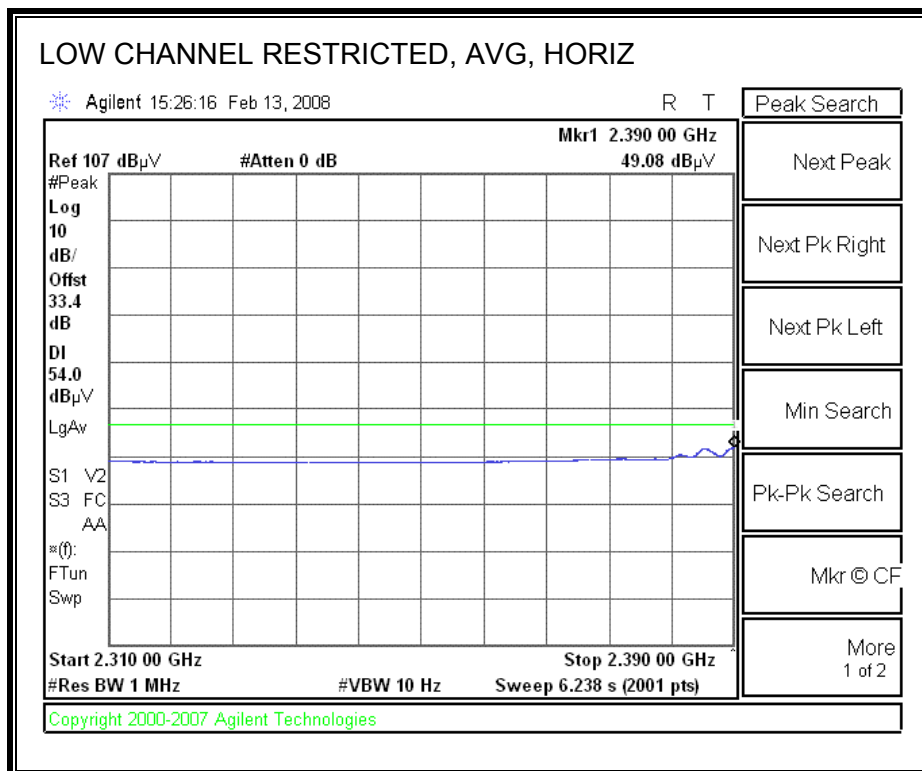
High Frequency Measurement															
Compliance Certification Services, Fremont 5m Chamber															
Company: Atheros Project #: 08U11615 Date: 2/14/2008 Test Engineer: Chin Pang Configuration: EUT/Antenna/Laptop Mode: TX, HT40 mode HB91-150-S0423															
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T73; S/N: 6717 @3m		T144 Miteq 3008A00931						FCC 15.209							
Hi Frequency Cables															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz, VBW=10Hz					
		Vien 187215002		C-5m Chamber				R_001							
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, 2422MHz</b>															
3.229	3.0	46.6	33.5	31.2	0.4	-37.2	0.0	0.0	40.9	27.8	74	54	-33.1	-26.2	V
4.844	3.0	49.0	35.0	33.8	0.3	-36.5	0.0	0.0	46.6	32.6	74	54	-27.4	-21.4	V
<b>Mid Ch, 2437MHz</b>															
3.249	3.0	48.2	34.6	31.2	0.4	-37.2	0.0	0.0	42.6	29.0	74	54	-31.4	-25.0	V
4.874	3.0	54.0	40.5	33.8	0.3	-36.5	0.0	0.0	51.7	38.2	74	54	-22.3	-15.8	V
7.311	3.0	62.5	50.2	36.2	0.9	-36.2	0.0	0.0	63.4	51.1	74	54	-10.6	-2.9	V
<b>High Ch, 2452MHz</b>															
3.269	3.0	48.5	35.6	31.2	0.4	-37.2	0.0	0.0	42.9	30.0	74	54	-31.1	-24.0	V
4.904	3.0	48.5	37.3	33.8	0.4	-36.5	0.0	0.0	46.2	35.0	74	54	-27.8	-19.0	V
7.356	3.0	60.5	48.8	36.2	0.9	-36.2	0.0	0.0	61.5	49.8	74	54	-12.5	-4.2	V
Rev. 4127															
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. FULL LENGTH BOARD (150-S0412)

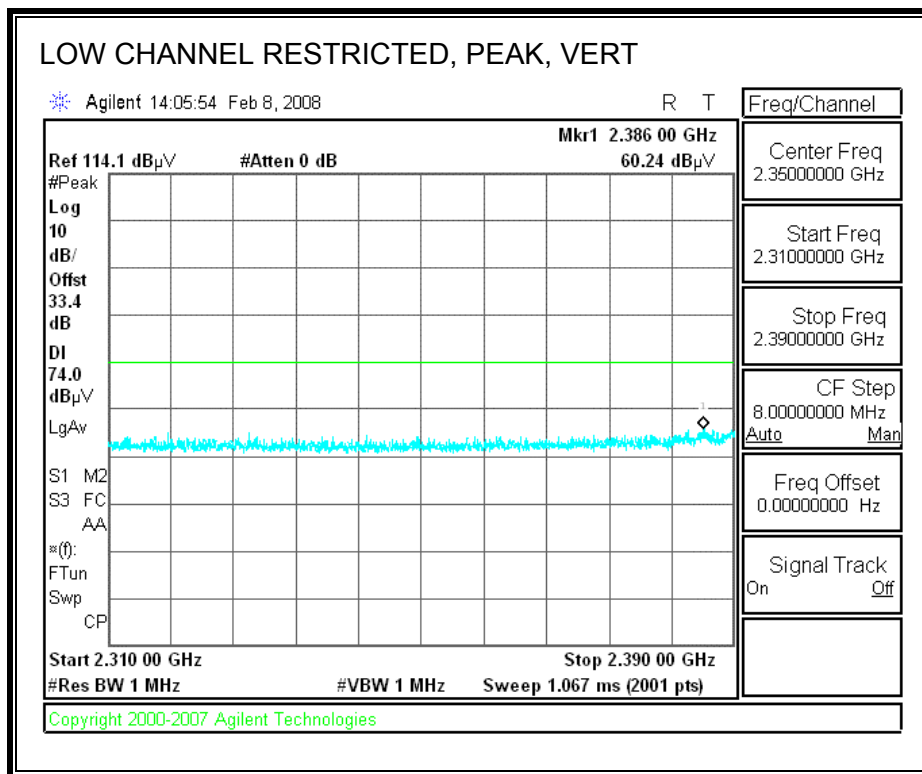
#### 8.3.1. TRANSMITTER ABOVE 1 GHz FOR 802.11b MODE IN THE 2.4 GHz BAND

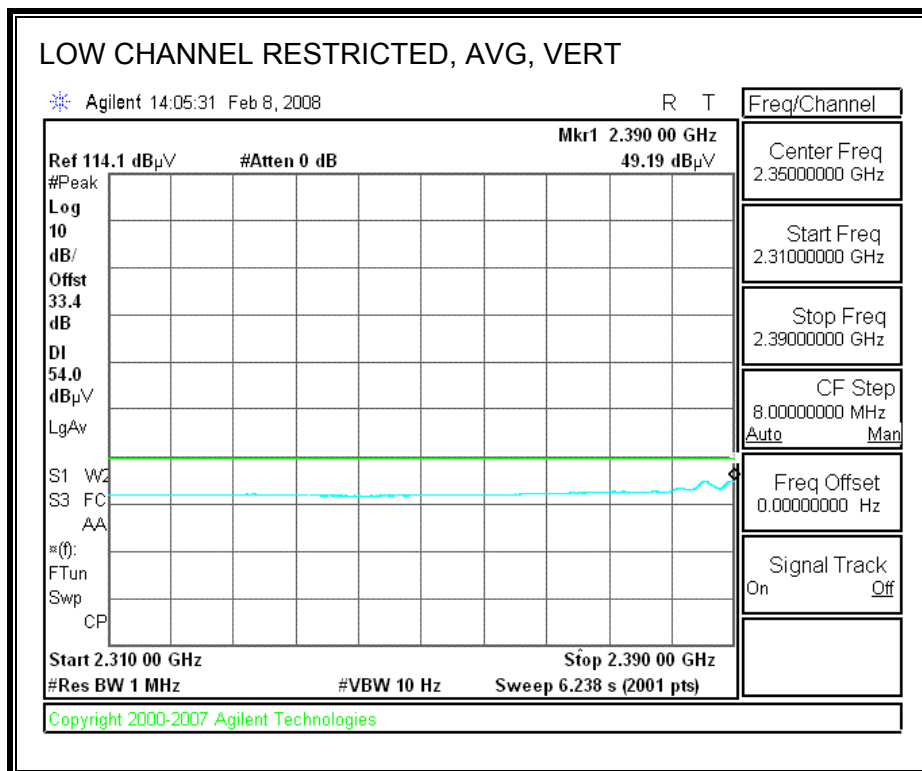
##### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



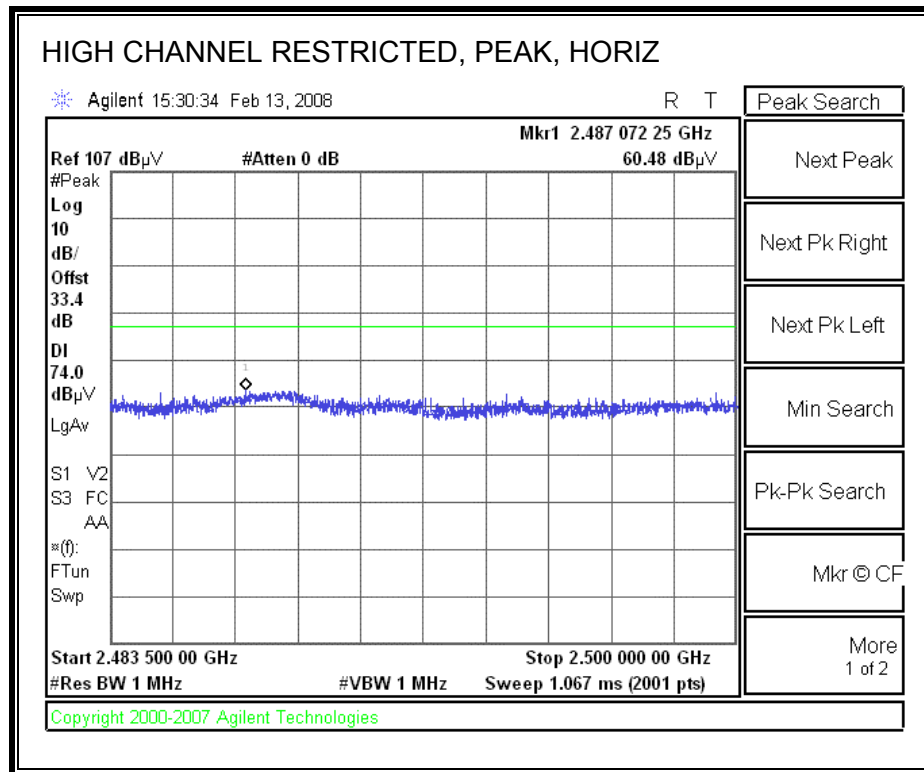


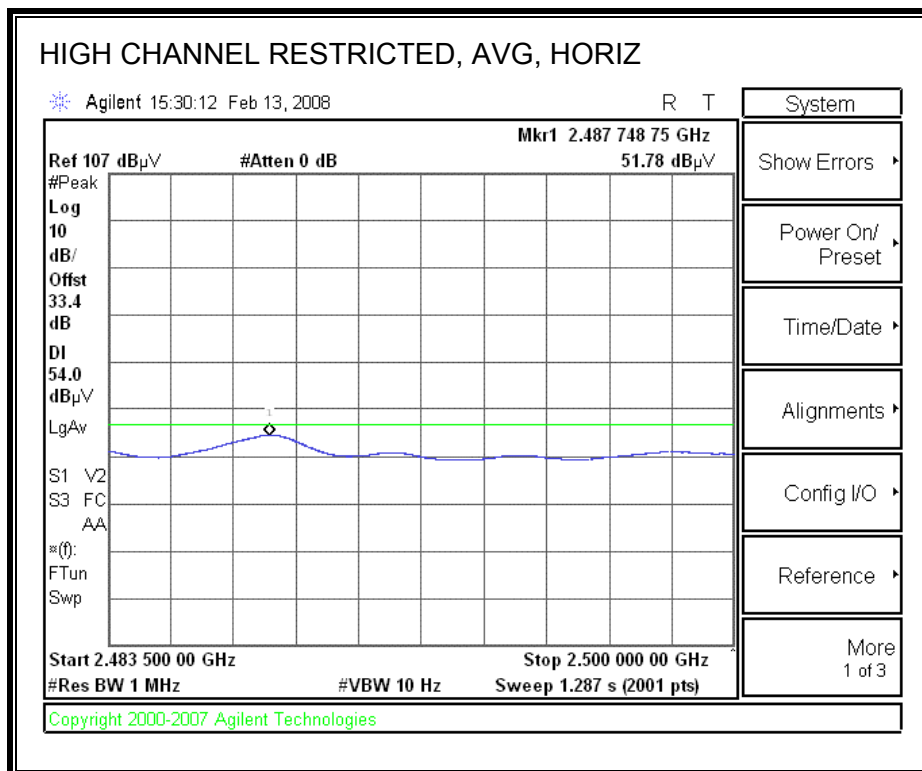
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**



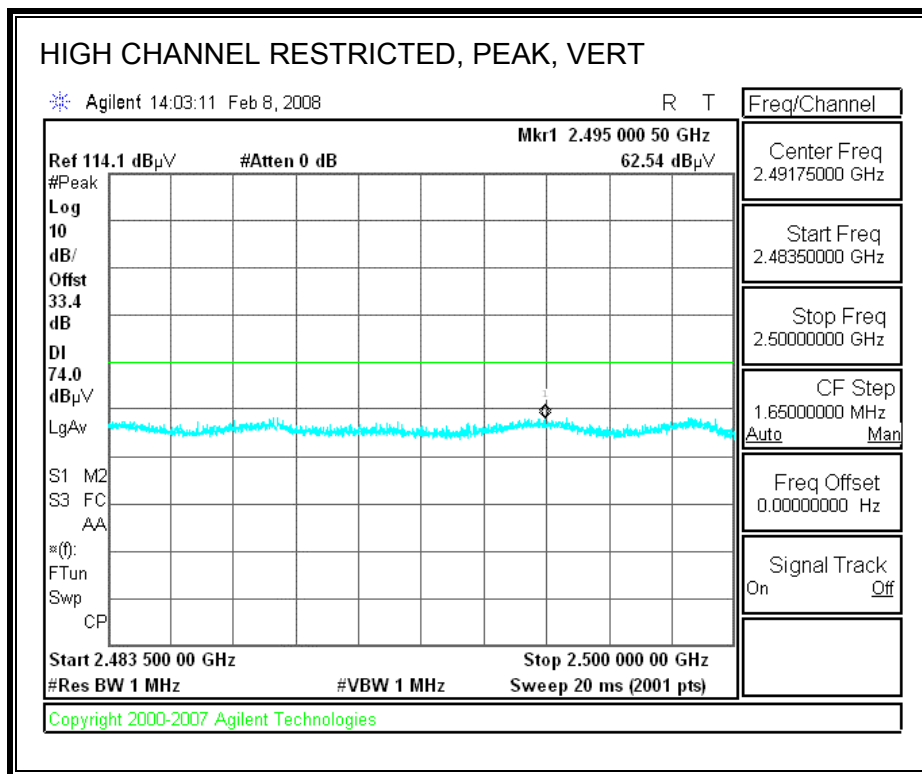


**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

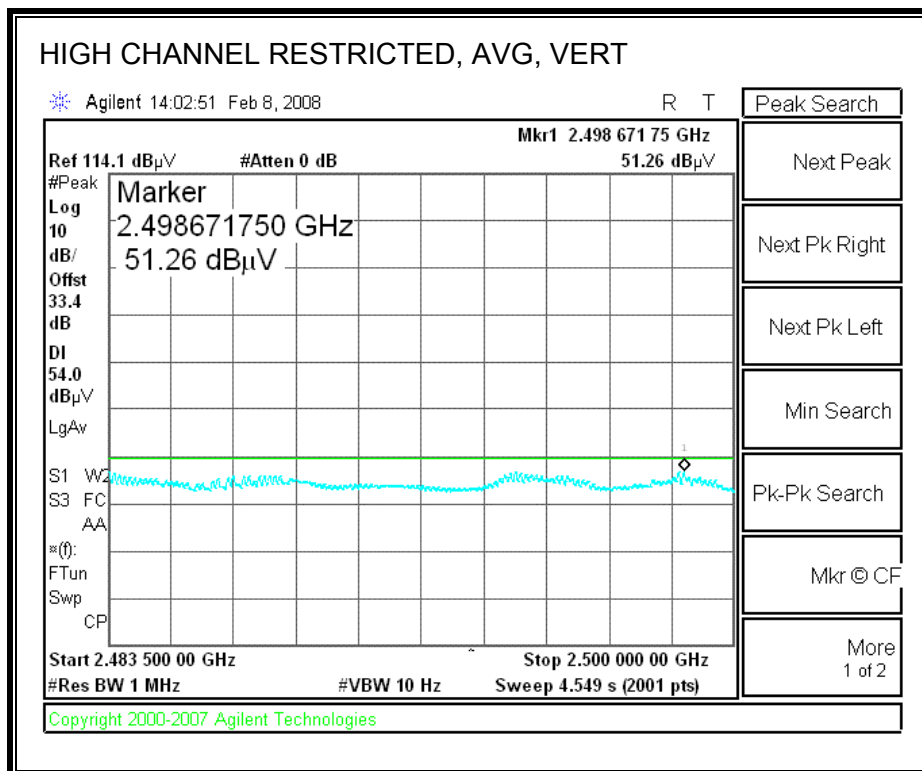




**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**





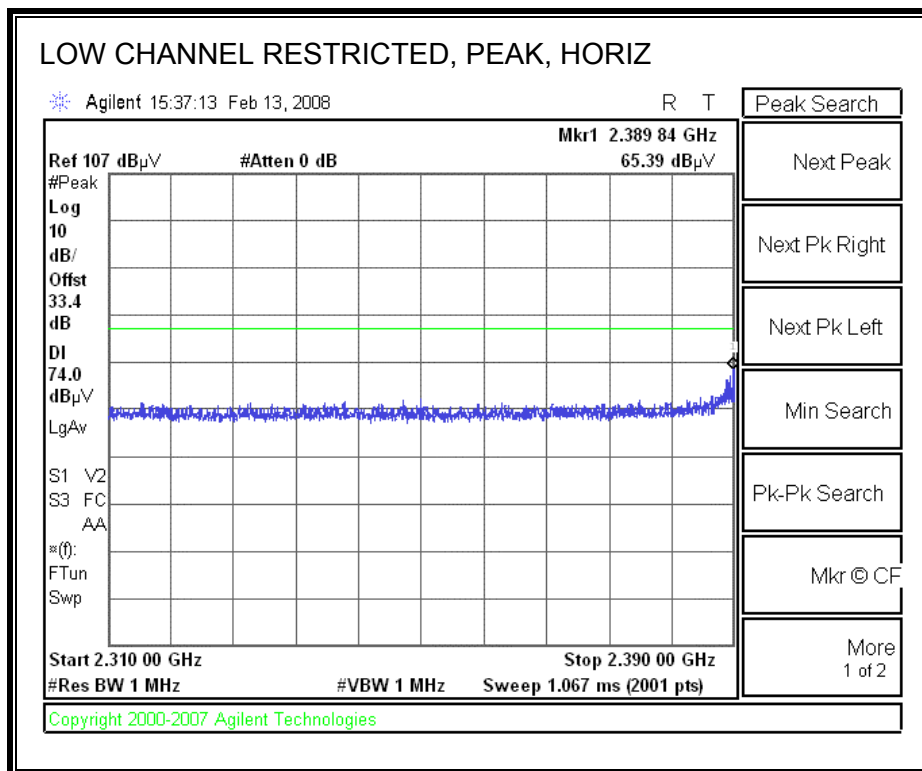


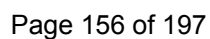
## HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement															
Compliance Certification Services, Fremont 5m Chamber															
Company: Atheros Project #: 08U11615 Date: 2/13/2008 Test Engineer: Chin Pang Configuration: EUT/Antenna/Laptop Mode: TX, b mode XB91-150-S0412															
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															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz, VBW=10Hz					
				A-5m Chamber				R_001							
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>															
3.216	3.0	42.0	29.0	31.1	5.5	-35.7	0.0	0.0	42.9	29.9	74	54	-31.1	-24.1	V
4.824	3.0	48.0	45.1	33.7	6.9	-34.8	0.0	0.0	53.8	50.9	74	54	-20.2	-3.1	V
3.216	3.0	40.6	28.3	31.1	5.5	-35.7	0.0	0.0	41.5	29.2	74	54	-32.5	-24.8	H
4.824	3.0	46.1	43.2	33.7	6.9	-34.8	0.0	0.0	51.9	49.0	74	54	-22.1	-5.0	H
<b>Mid Ch</b>															
3.249	3.0	41.0	28.4	31.2	5.5	-35.7	0.0	0.0	42.1	29.5	74	54	-31.9	-24.5	V
4.874	3.0	50.0	47.6	33.8	6.9	-34.8	0.0	0.0	55.9	53.5	74	54	-18.1	-0.5	V
7.311	3.0	47.4	41.7	36.2	8.4	-34.1	0.0	0.0	57.9	52.2	74	54	-16.1	-1.8	V
3.249	3.0	42.4	26.9	31.2	5.5	-35.7	0.0	0.0	43.5	28.0	74	54	-30.5	-26.0	H
4.874	3.0	47.5	45.3	33.8	6.9	-34.8	0.0	0.0	53.4	51.2	74	54	-20.6	-2.8	H
7.311	3.0	46.4	41.0	36.2	8.4	-34.1	0.0	0.0	56.9	51.5	74	54	-17.1	-2.5	H
<b>High Ch</b>															
3.283	3.0	42.5	29.0	31.3	5.6	-35.6	0.0	0.0	43.7	30.2	74	54	-30.3	-23.8	V
4.924	3.0	50.1	47.4	33.9	7.0	-34.8	0.0	0.0	56.1	53.4	74	54	-17.9	-0.6	V
7.386	3.0	49.4	42.5	36.3	8.4	-34.1	0.0	0.0	60.0	53.1	74	54	-14.0	-0.9	V
3.283	3.0	39.2	28.2	31.3	5.6	-35.6	0.0	0.0	40.4	29.4	74	54	-33.6	-24.6	H
4.924	3.0	44.3	41.6	33.9	7.0	-34.8	0.0	0.0	50.3	47.6	74	54	-23.7	-6.4	H
7.386	3.0	44.7	39.0	36.3	8.4	-34.1	0.0	0.0	55.3	49.6	74	54	-18.7	-4.4	H
Rev. 4.12.7															
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										

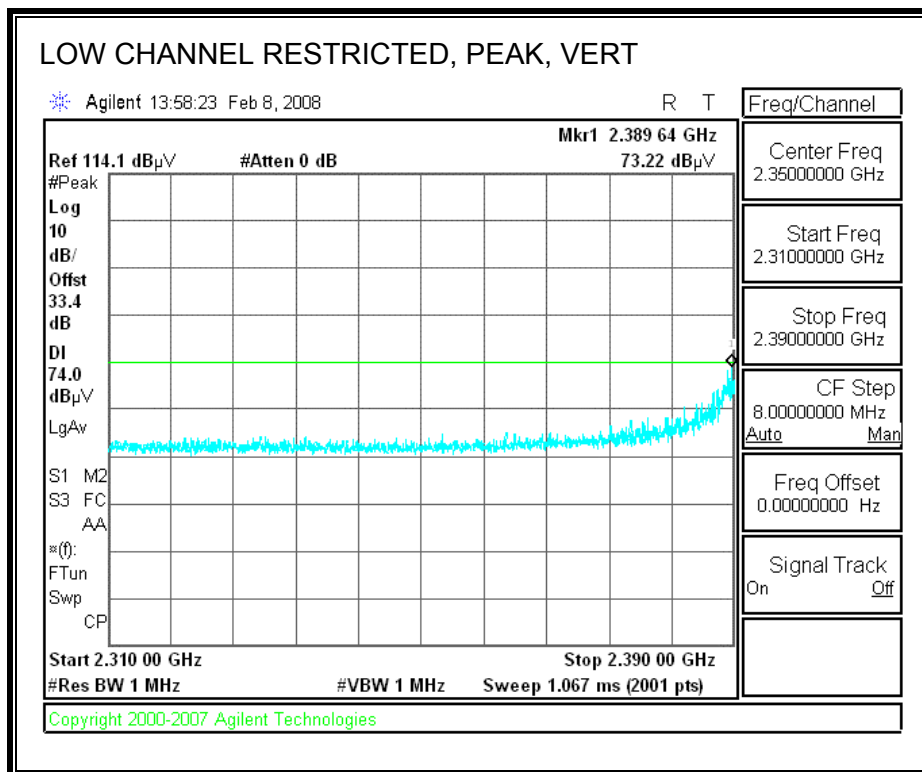
### 8.3.2. TRANSMITTER ABOVE 1 GHz FOR 802.11g MODE IN THE 2.4 GHz BAND

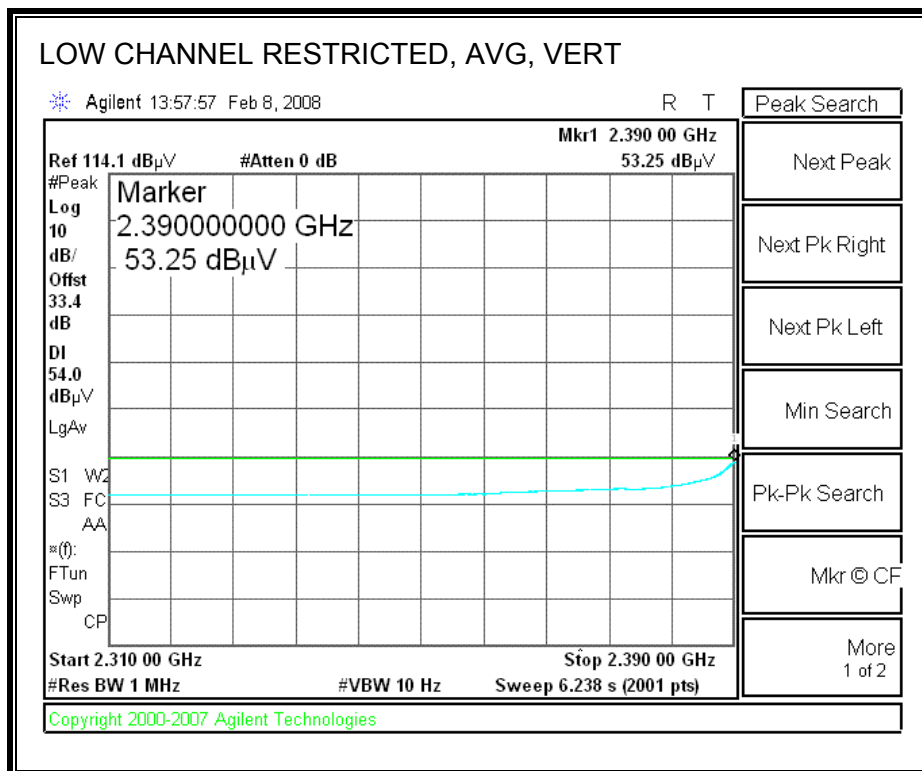
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



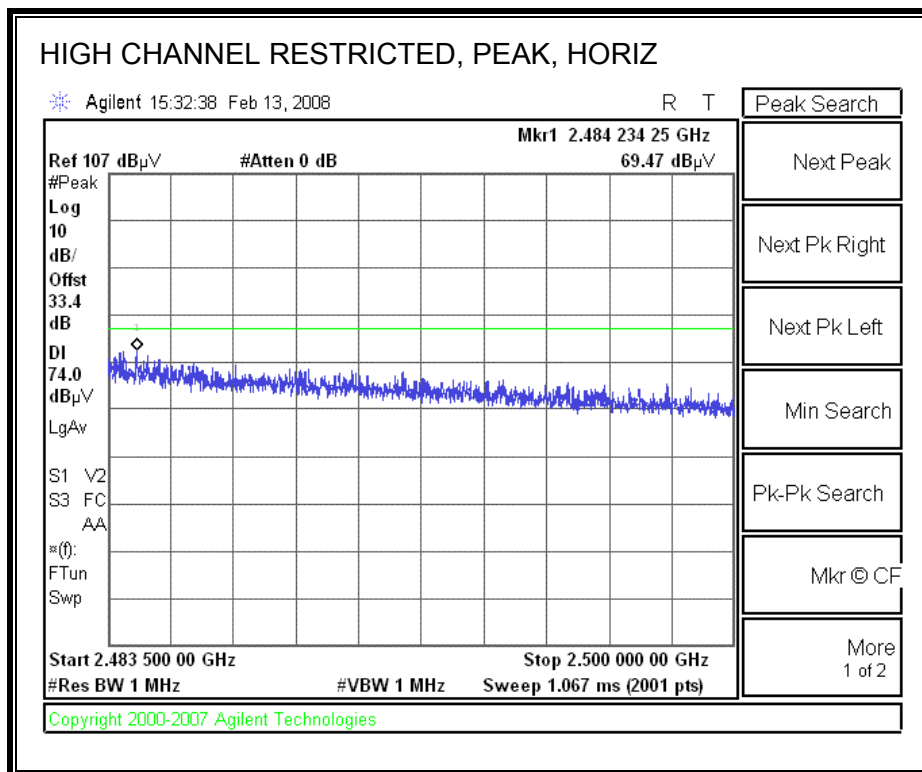


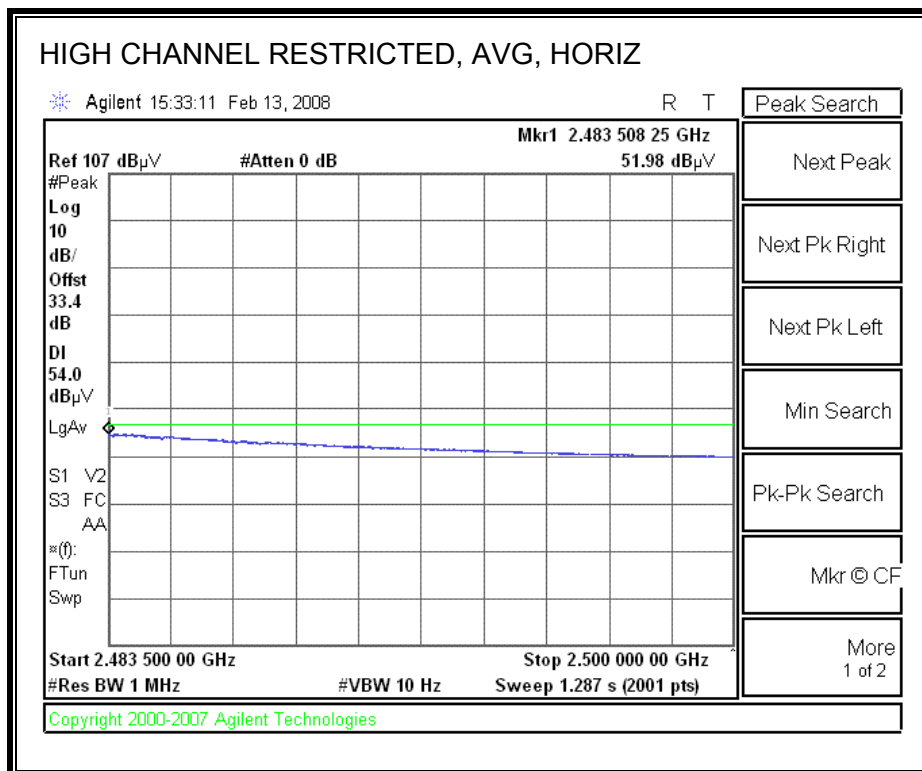
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**





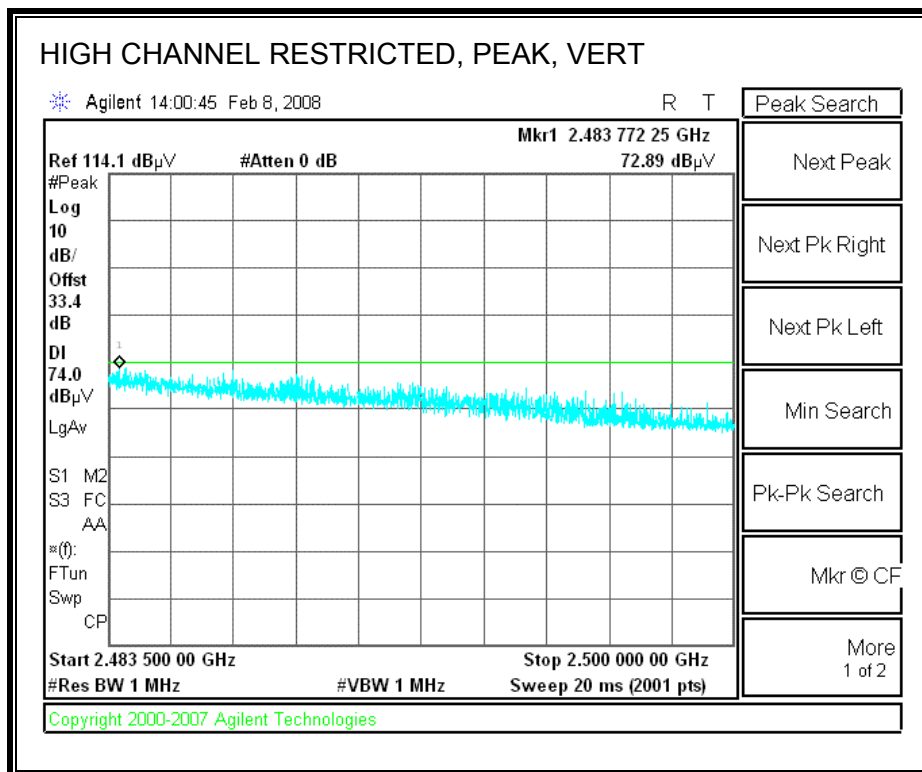
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

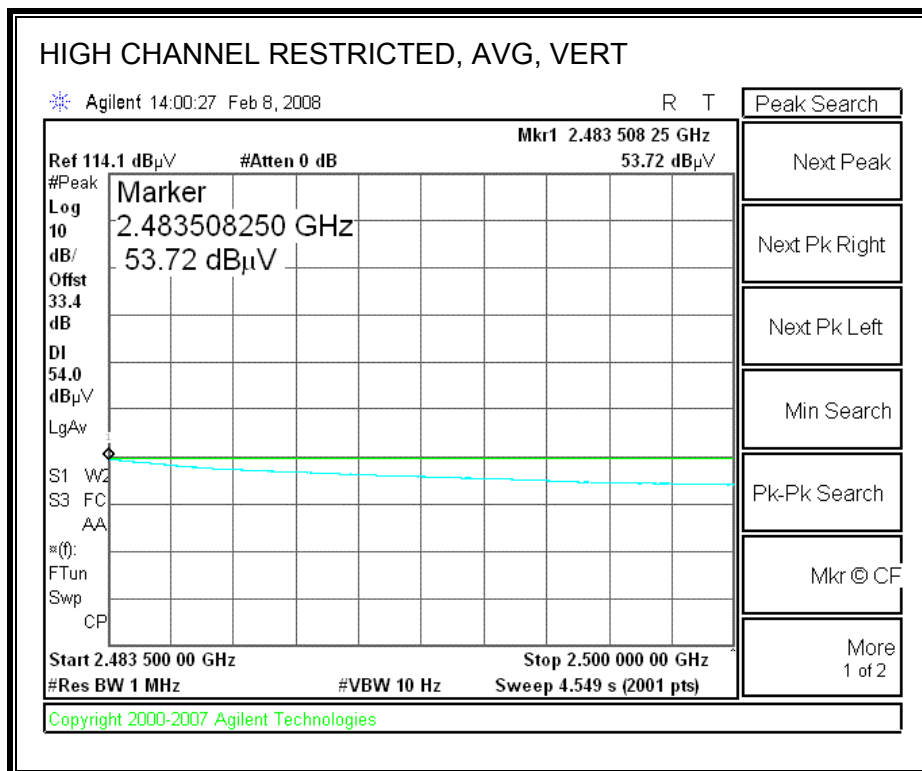






**RESTRICTED BANEDGE (HIGH CHANNEL, VERTICAL)**



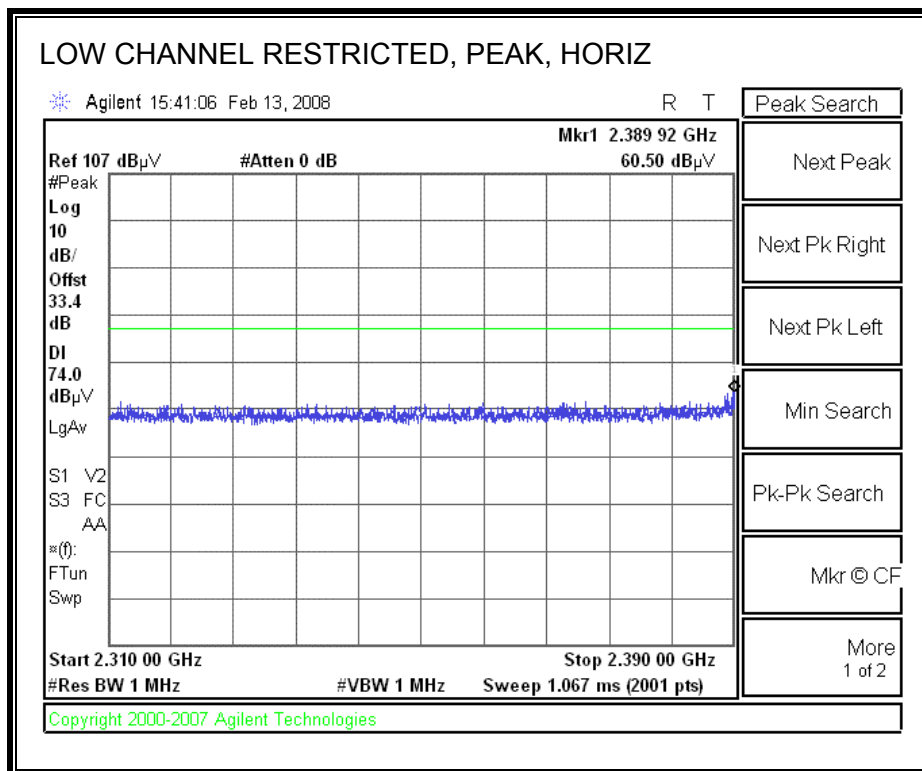


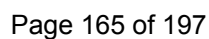
## HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement															
Compliance Certification Services, Fremont 5m Chamber															
Company: Atheros Project #: 08U11615 Date: 2/14/2008 Test Engineer: Chin Pang Configuration: EUT/Antenna/Laptop Mode: TX, G mode XB91-150-S0412															
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T60; S/N: 2238 @3m		T144 Miteq 3008A00931						FCC 15.209							
Hi Frequency Cables															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz, VBW=10Hz					
		Vien 187215002		C-5m Chamber				R_001							
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>															
3.216	3.0	46.5	34.0	31.3	0.4	-37.2	0.0	0.0	41.0	28.5	74	54	-33.0	-25.5	V
4.824	3.0	53.0	38.0	33.7	0.3	-36.5	0.0	0.0	50.5	35.5	74	54	-23.5	-18.5	V
<b>Mid Ch</b>															
3.249	3.0	47.0	35.3	31.4	0.4	-37.2	0.0	0.0	41.6	29.9	74	54	-32.4	-24.1	V
4.874	3.0	55.6	42.5	33.7	0.3	-36.5	0.0	0.0	53.2	40.1	74	54	-20.8	-13.9	V
7.311	3.0	64.8	51.7	36.7	0.9	-36.2	0.0	0.0	66.2	53.1	74	54	-7.8	-0.9	V
<b>High Ch</b>															
3.283	3.0	46.6	34.1	31.5	0.3	-37.1	0.0	0.0	41.3	28.8	74	54	-32.7	-25.2	V
4.924	3.0	52.0	39.0	33.8	0.4	-36.5	0.0	0.0	49.7	36.7	74	54	-24.3	-17.3	V
7.386	3.0	67.2	51.3	36.8	0.9	-36.2	0.0	0.0	68.7	52.8	74	54	-5.3	-1.2	V
Rev. 4.12.7															
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											

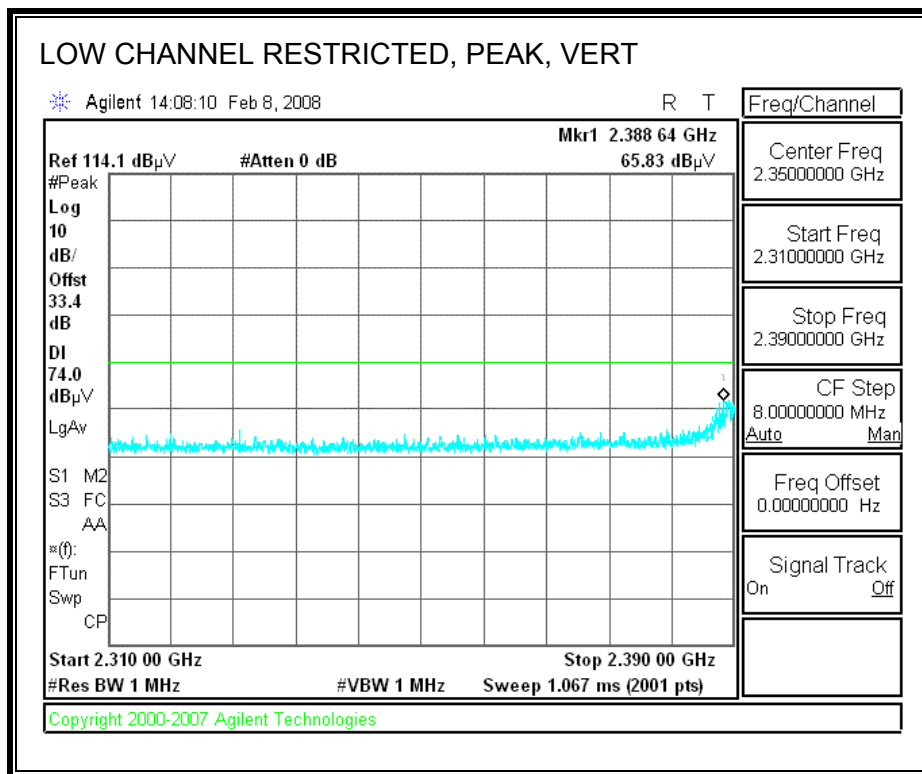
### 8.3.3. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 2.4 GHz BAND

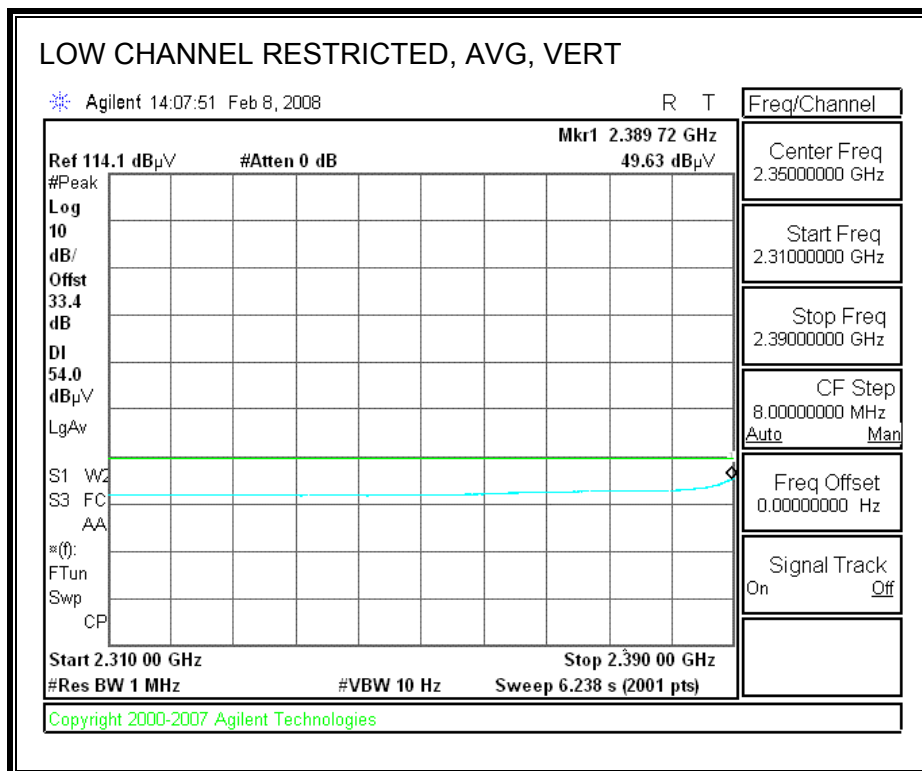
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



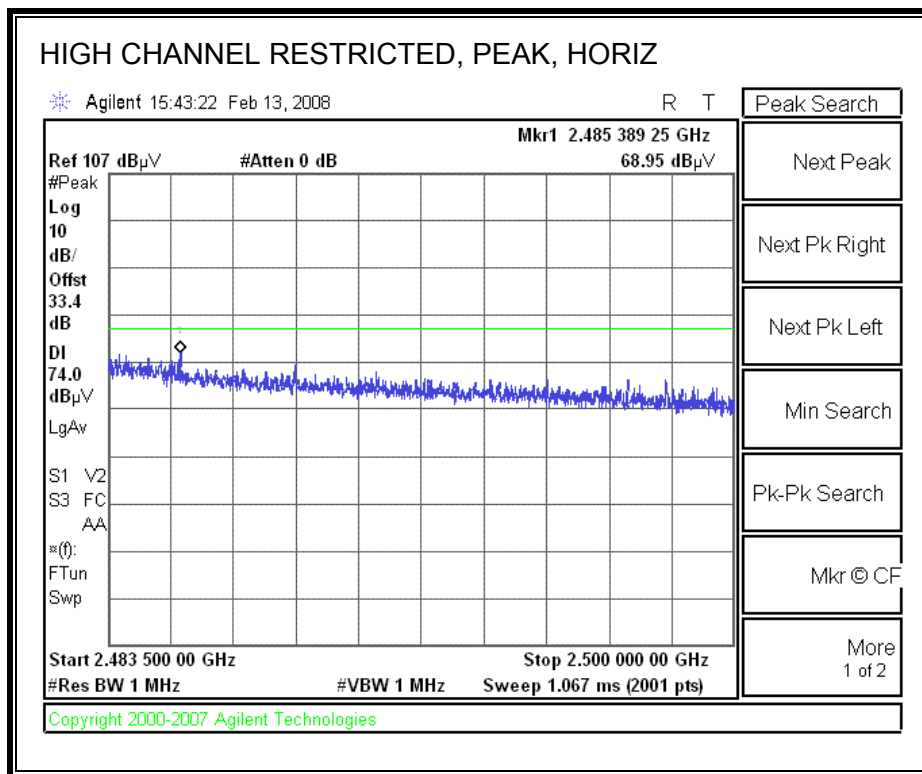


**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**

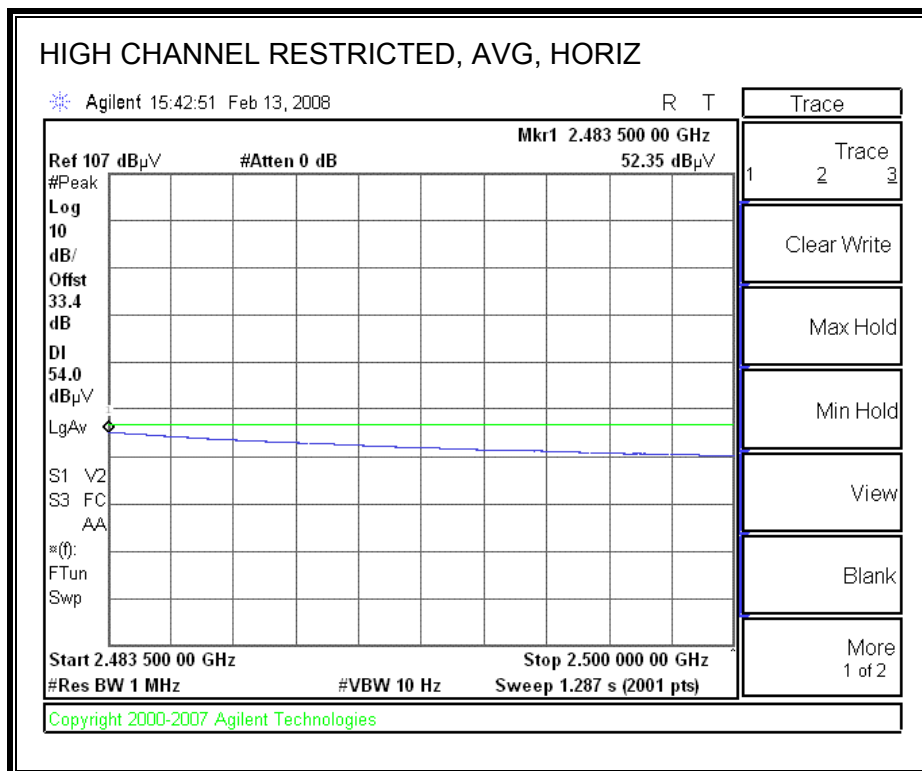




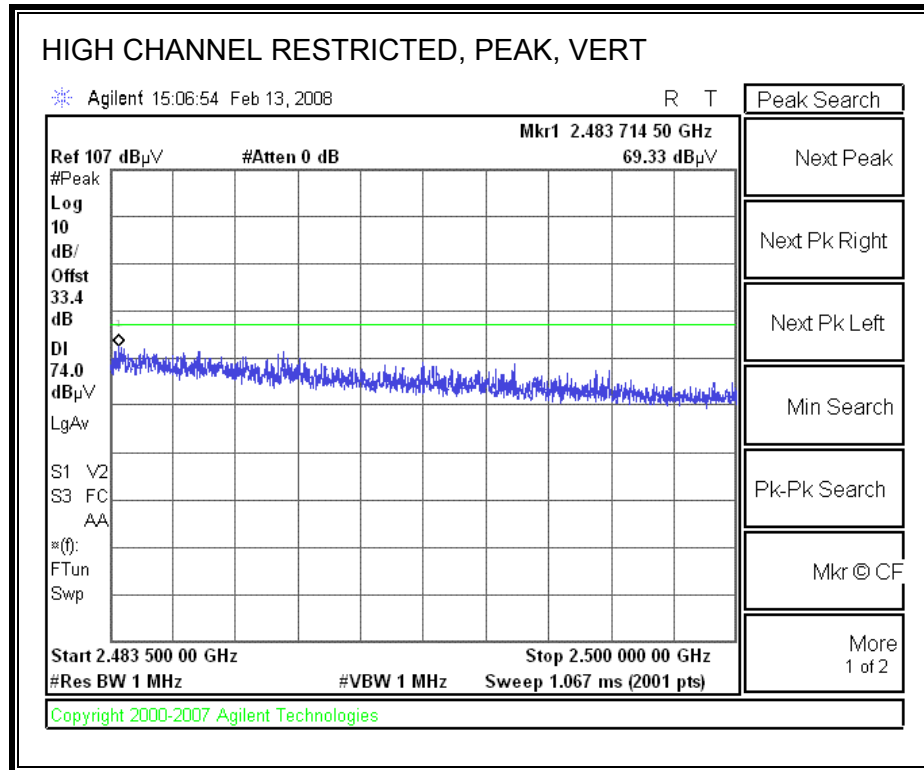
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

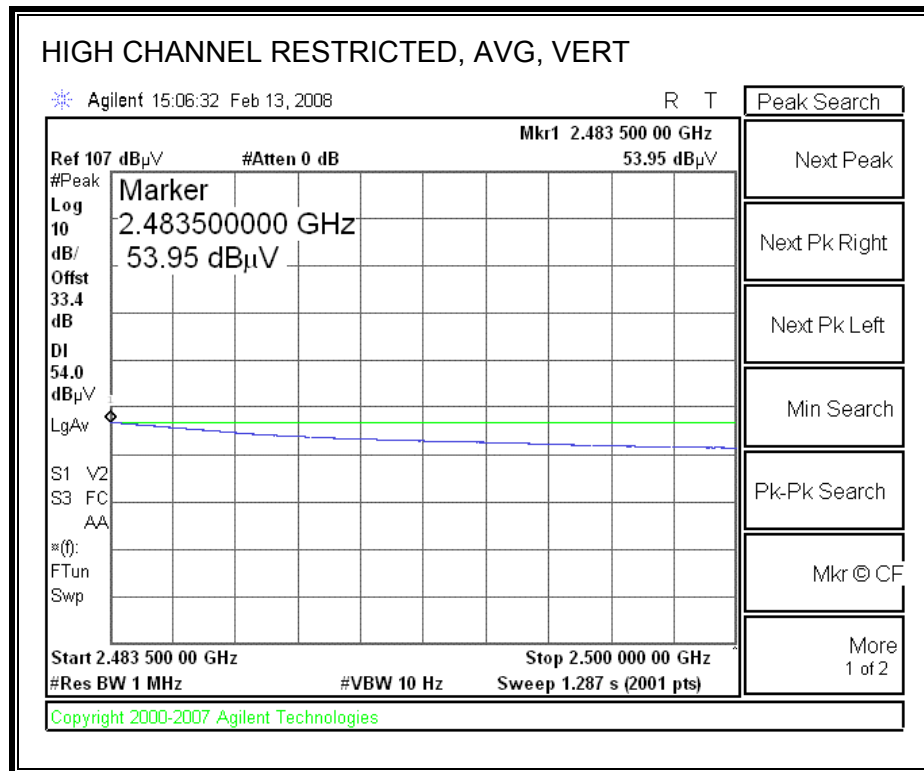






**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**



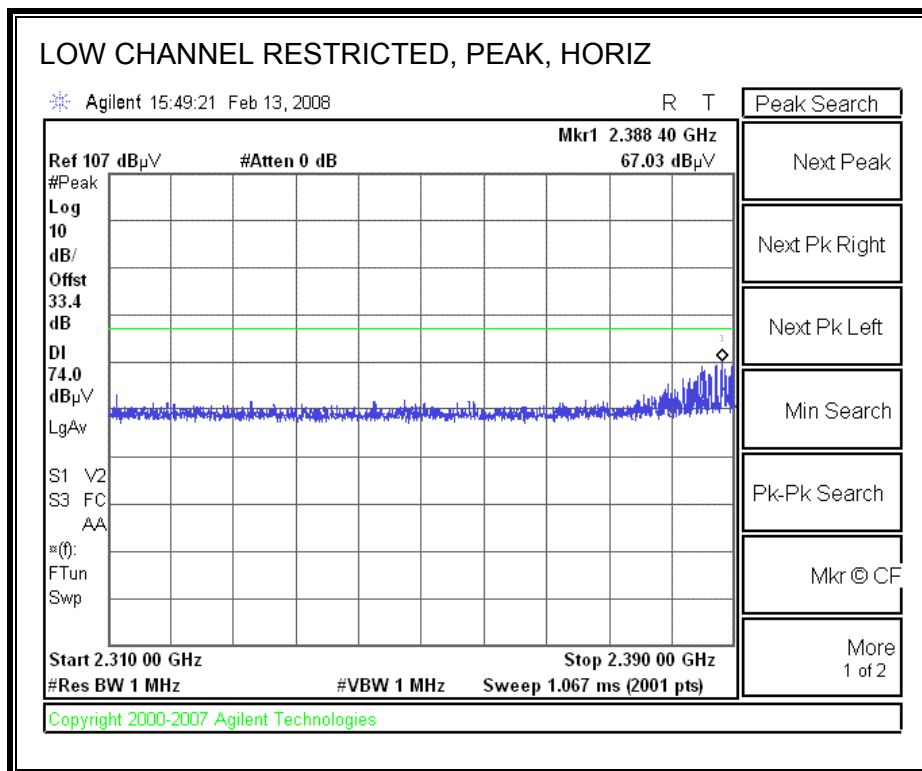


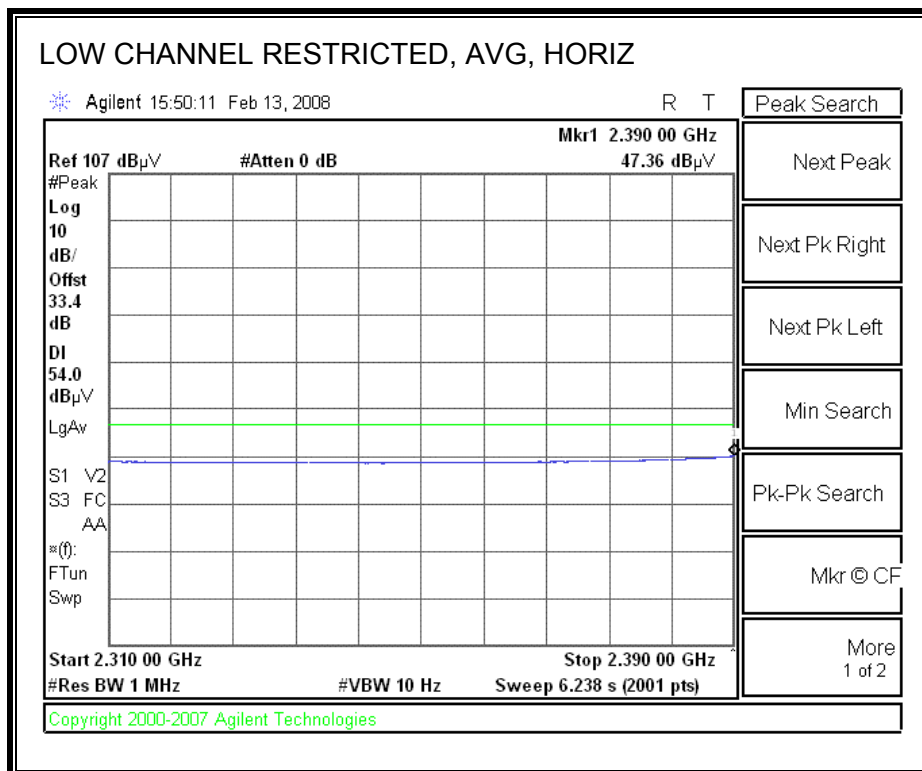
## HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement															
Compliance Certification Services, Fremont 5m Chamber															
Company: Atheros Project #: 08U11615 Date: 2/14/2008 Test Engineer: Chin Pang Configuration: EUT/Antenna/Laptop Mode: TX, HT20 mode XB91-150-S0412															
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T60; S/N: 2238 @3m		T144 Miteq 3008A00931						FCC 15.209							
Hi Frequency Cables															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz, VBW=10Hz					
		Vien 187215002		C-5m Chamber				R_001							
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>															
3.216	3.0	45.3	33.7	31.3	0.4	-37.2	0.0	0.0	39.8	28.2	74	54	-34.2	-25.8	V
4.824	3.0	50.0	37.0	33.7	0.3	-36.5	0.0	0.0	47.5	34.5	74	54	-26.5	-19.5	V
<b>Mid Ch</b>															
3.249	3.0	46.0	34.4	31.4	0.4	-37.2	0.0	0.0	40.6	29.0	74	54	-33.4	-25.0	V
4.874	3.0	54.0	42.0	33.7	0.3	-36.5	0.0	0.0	51.6	39.6	74	54	-22.4	-14.4	V
7.311	3.0	65.4	51.6	36.7	0.9	-36.2	0.0	0.0	66.8	53.0	74	54	-7.2	-1.0	V
<b>High Ch</b>															
3.283	3.0	44.0	33.2	31.5	0.3	-37.1	0.0	0.0	38.7	27.9	74	54	-35.3	-26.1	V
4.924	3.0	51.6	38.0	33.8	0.4	-36.5	0.0	0.0	49.3	35.7	74	54	-24.7	-18.3	V
7.386	3.0	66.2	49.9	36.8	0.9	-36.2	0.0	0.0	67.7	51.4	74	54	-6.3	-2.6	V
Rev. 4127															
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											

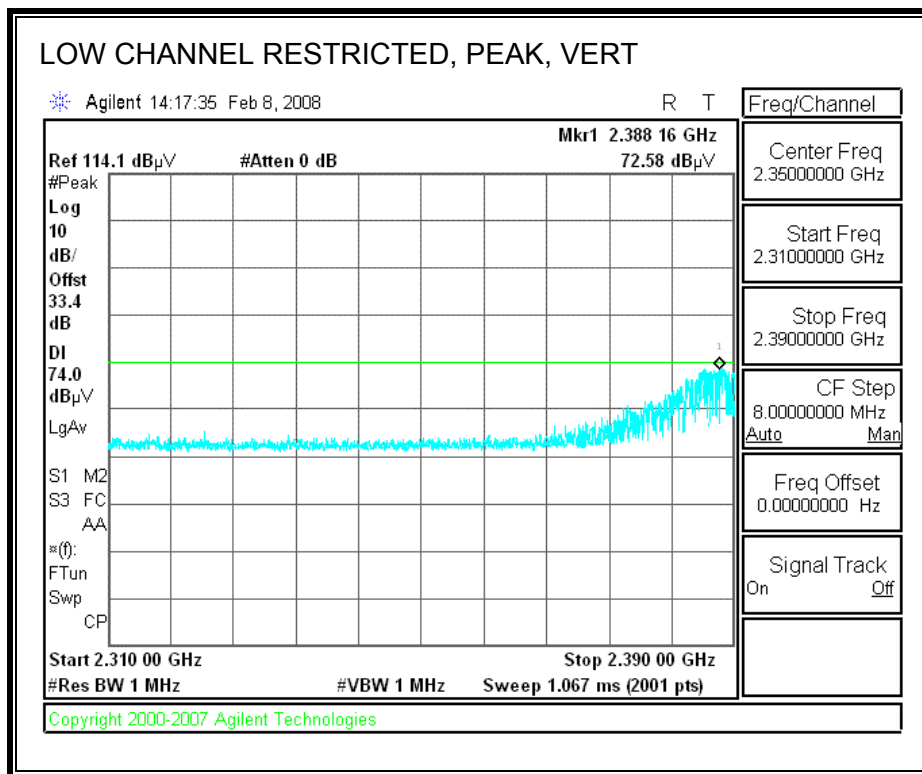
### 8.3.4. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE 2.4 GHz BAND

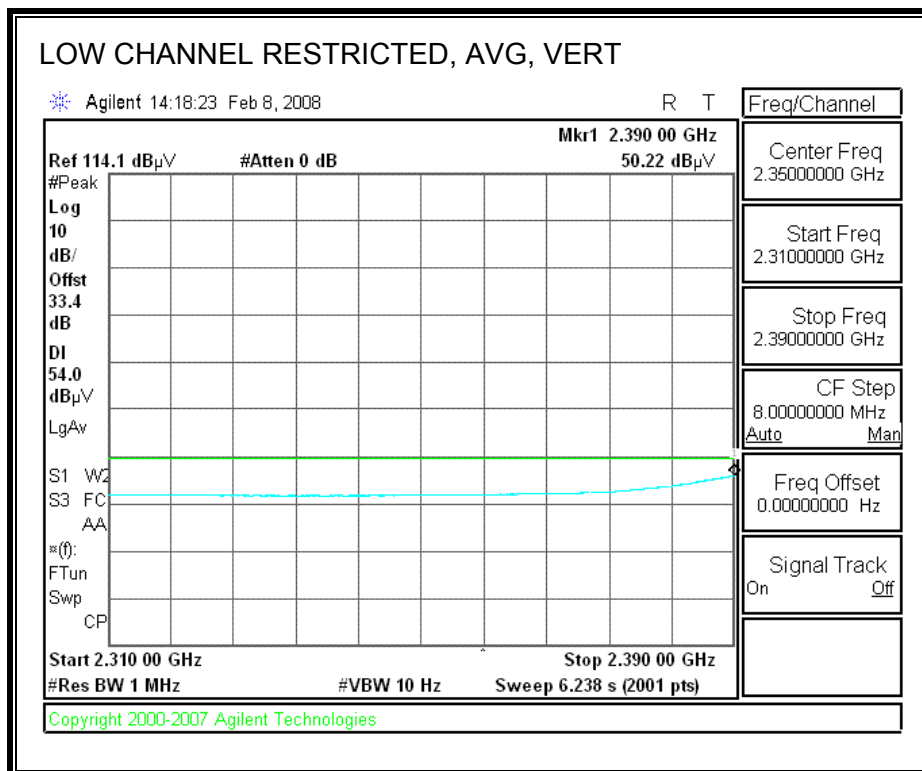
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





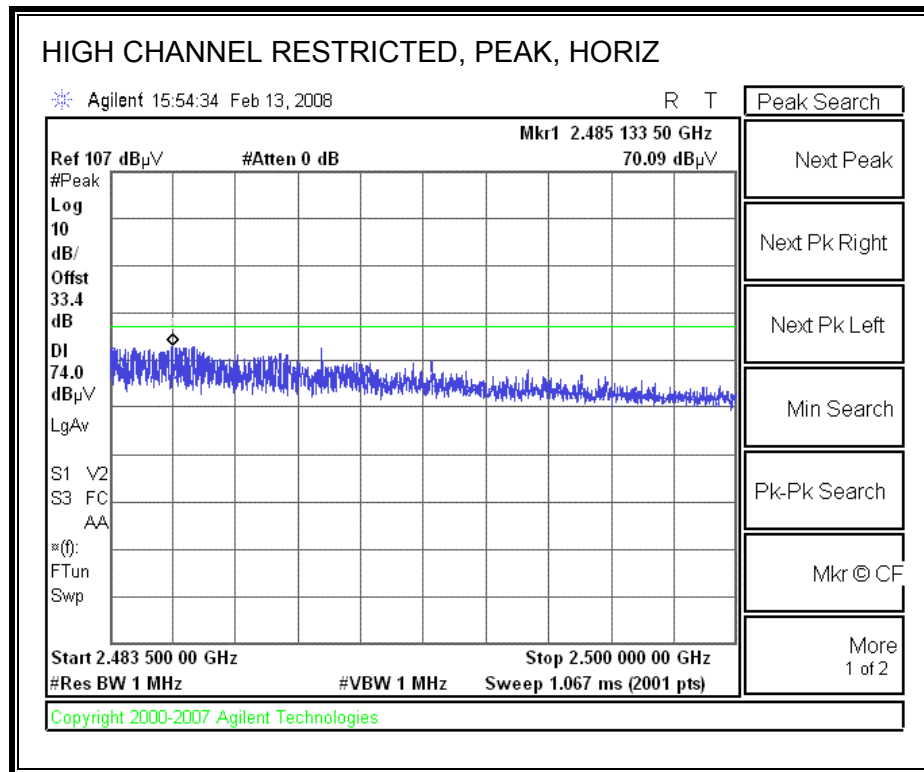
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**

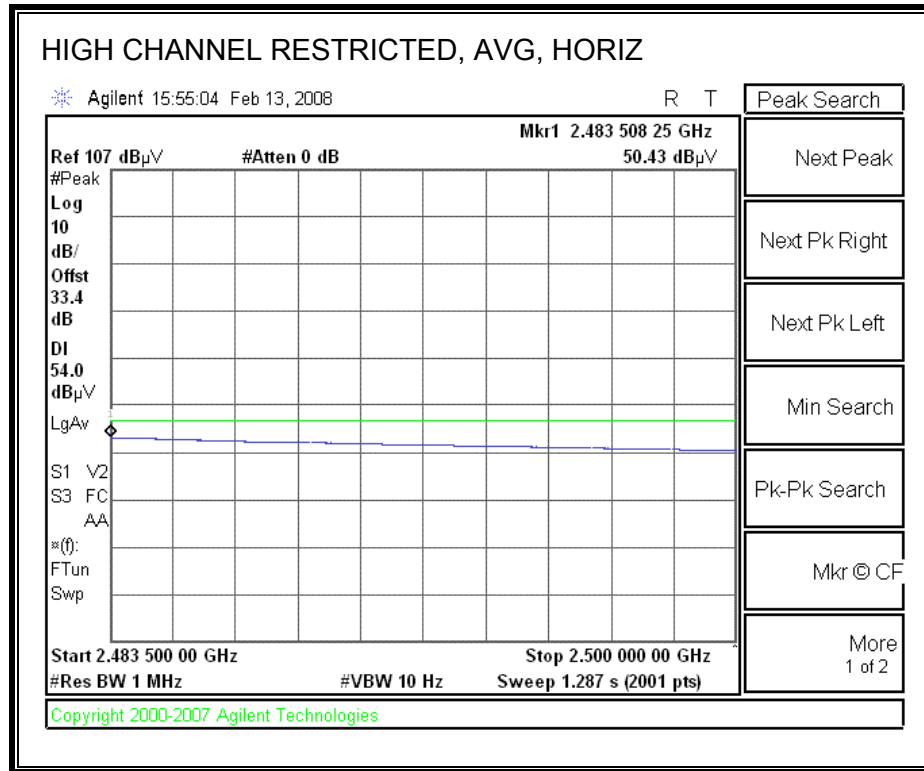




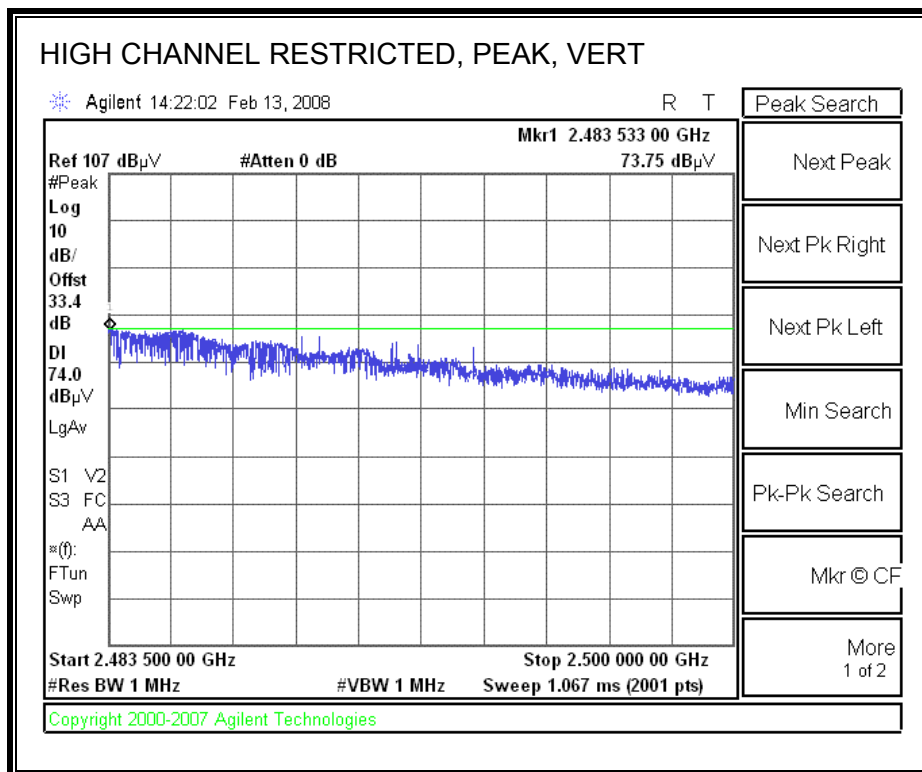


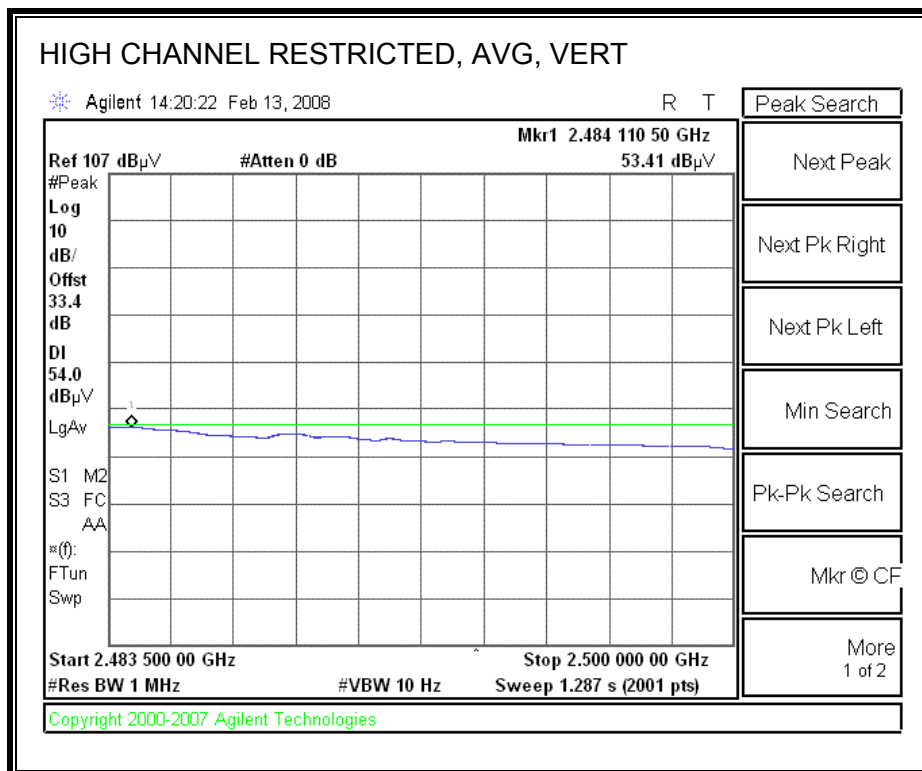
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





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





## HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement															
Compliance Certification Services, Fremont 5m Chamber															
Company: Atheros Project #: 08U11615 Date: 2/14/2008 Test Engineer: Chin Pang Configuration: EUT/Antenna/Laptop Mode: TX, HT40 mode XB91-150-S0412															
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T60; S/N: 2238 @3m		T144 Miteq 3008A00931						FCC 15.209							
Hi Frequency Cables															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz, VBW=10Hz					
		Vien 187215002		C-5m Chamber				R_001							
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, 2422MHz</b>															
3.229	3.0	45.3	33.7	31.4	0.4	-37.2	0.0	0.0	39.8	28.2	74	54	-34.2	-25.8	V
4.844	3.0	51.4	37.6	33.7	0.3	-36.5	0.0	0.0	49.0	35.2	74	54	-25.0	-18.8	V
7.266	3.0	53.6	38.2	36.7	0.9	-36.2	0.0	0.0	55.0	39.6	74	54	-19.0	-14.4	V
<b>Mid Ch, 2437MHz</b>															
3.249	3.0	46.0	34.4	31.4	0.4	-37.2	0.0	0.0	40.6	29.0	74	54	-33.4	-25.0	V
4.874	3.0	55.0	42.5	33.7	0.3	-36.5	0.0	0.0	52.6	40.1	74	54	-21.4	-13.9	V
7.311	3.0	64.0	51.7	36.7	0.9	-36.2	0.0	0.0	65.4	53.1	74	54	-8.6	-0.9	V
<b>High Ch, 2452MHz</b>															
3.269	3.0	46.9	36.5	31.4	0.4	-37.2	0.0	0.0	41.5	31.1	74	54	-32.5	-22.9	V
4.904	3.0	51.5	37.3	33.8	0.4	-36.5	0.0	0.0	49.2	35.0	74	54	-24.8	-19.0	V
7.356	3.0	64.0	49.7	36.8	0.9	-36.2	0.0	0.0	65.5	51.2	74	54	-8.5	-2.8	V
Rev. 4127															
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											

## 8.4. WORST-CASE BELOW 1 GHz

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

#### HORIZONTAL DATA

Condition: FCC CLASS-B HORIZONTAL  
Engineer: : Chin Pang  
Company: : Atheros  
Project #: : 08U11615  
Test Configuration: EUT/Antenna/Laptop  
Mode of operation: : TX ( Worst Case )  
Test Target: : FCC Class B  
: EUT SN: HB91-150-S0423

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	145.430	49.04	-13.54	35.50	43.50	-8.00	Peak
2	400.540	46.06	-9.91	36.15	46.00	-9.85	Peak
3	526.640	35.91	-6.87	29.04	46.00	-16.96	Peak
4	565.440	36.91	-6.06	30.85	46.00	-15.15	Peak
5	601.330	38.72	-5.37	33.35	46.00	-12.65	Peak
6	698.330	33.64	-3.54	30.11	46.00	-15.90	Peak
7	800.180	36.62	-2.06	34.56	46.00	-11.44	Peak
8	900.090	38.63	-1.02	37.61	46.00	-8.39	Peak

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

**VERTICAL DATA**

Condition: FCC CLASS-B VERTICAL  
Engineer: : Chin Pang  
Company: : Atheros  
Project #: : 08U11615  
Test Configuration: : EUT/Antenna/Laptop  
Mode of operation: : TX ( Worst Case )  
Test Target: : FCC Class B  
: EUT SN: HB91-150-S0423

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	58.130	55.26	-19.59	35.67	40.00	-4.33	Peak
2	402.480	43.80	-9.86	33.94	46.00	-12.06	Peak
3	502.390	39.64	-7.34	32.30	46.00	-13.70	Peak
4	601.330	35.99	-5.37	30.62	46.00	-15.38	Peak
5	691.540	38.49	-3.69	34.80	46.00	-11.20	Peak
6	800.180	32.33	-2.06	30.27	46.00	-15.73	Peak
7	902.030	31.38	-1.01	30.37	46.00	-15.63	Peak





## 9. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

<sup>\*</sup> Decreases with the logarithm of the frequency.

### TEST PROCEDURE

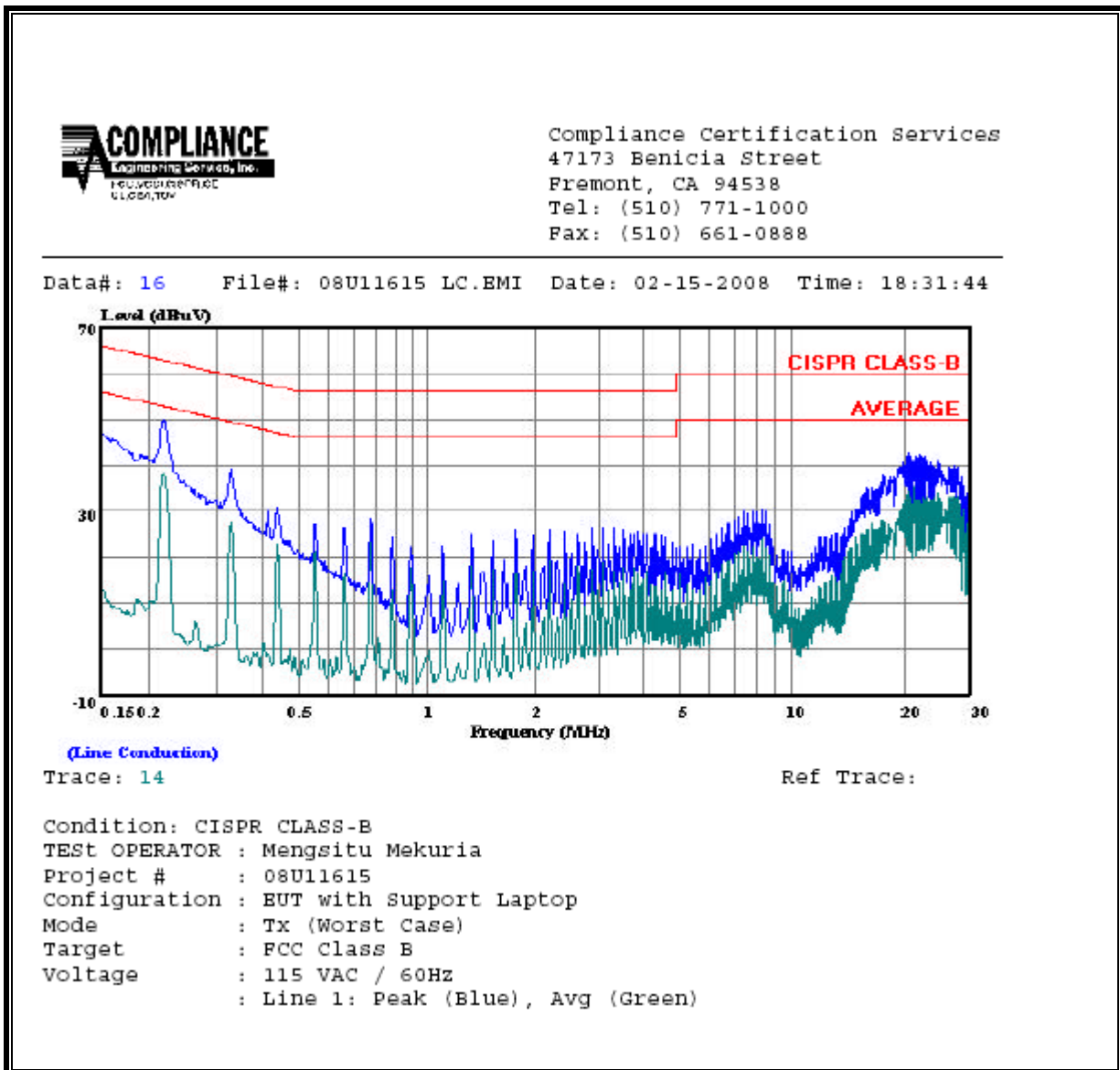
ANSI C63.4

### RESULTS

# **6 WORST EMISSIONS**

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.22	49.84	--	38.06	0.00	62.82	52.82	-12.98	-14.76	L1
0.33	39.18	--	27.91	0.00	59.45	49.45	-20.27	-21.54	L1
20.59	42.64	--	35.83	0.00	60.00	50.00	-17.36	-14.17	L1
0.22	50.91	--	38.67	0.00	62.82	52.82	-11.91	-14.15	L2
0.33	39.46	--	28.98	0.00	59.45	49.45	-19.99	-20.47	L2
17.29	35.14	--	23.09	0.00	60.00	50.00	-24.86	-26.91	L2
6 Worst Data									

**LINE 1 RESULTS**

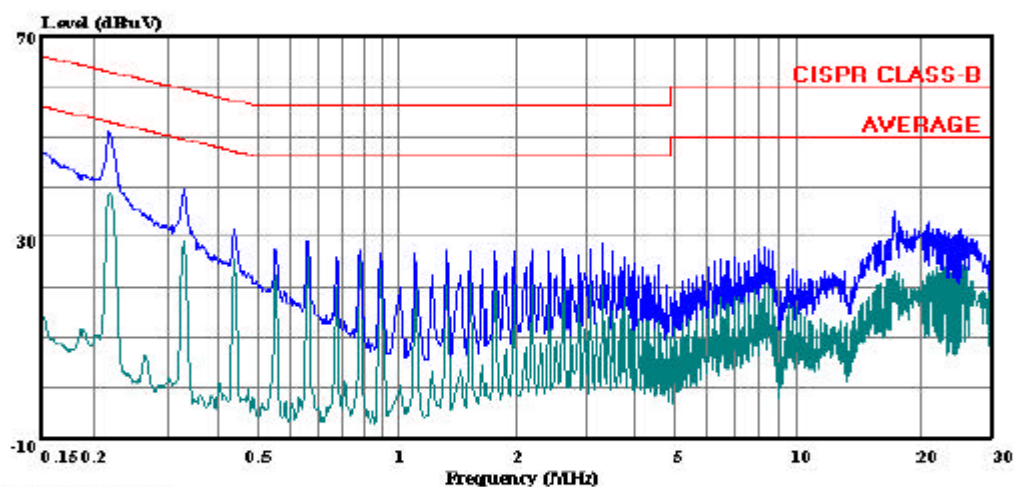


## LINE 2 RESULTS



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

Data#: 7 File#: 08U11615 LC.EMI Date: 02-15-2008 Time: 18:10:17



(Line Conduction)

Trace: 5

Ref Trace:

Condition: CISPR CLASS-B  
TEST OPERATOR : Mengsitu Mekuria  
Project # : 08U11615  
Configuration : BUT with Support Laptop  
Mode : Tx (Worst Case)  
Target : FCC Class B  
Voltage : 115 VAC / 60Hz  
Line 2: Peak (Blue), Avg (Green)

## 10. MAXIMUM PERMISSIBLE EXPOSURE

### FCC RULES

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

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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

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

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

f = frequency in MHz

\* = Plane-wave equivalent power density

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

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

## 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).

## **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  $S = 1.0 \text{ mW/cm}^2$

From IC Safety Code 6, Section 2.2 Table 5 Column 4,  $S = 10 \text{ W/m}^2$

## **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> )
WLAN	2.4 GHz	20.0	26.06	3.62	0.18	1.85