



**FCC CFR47 PART 15 SUBPART E  
INDUSTRY CANADA RSS-210 ISSUE 7  
CLASS II PERMISSIVE CHANGE**

**CERTIFICATION TEST REPORT**

**FOR**

**802.11n 2x2 PCIe MINICARD TRANSCEIVER**

**FCC ID: PPD-AR5BXB92  
FCC Model: AR5BXB92**

**IC: 4104A-AR5BXB92  
IC Model: AR5BXB92**

**REPORT NUMBER: 08U11886-6, Revision A**

**ISSUE DATE: JULY 23, 2008**

*Prepared for*  
**ATHEROS COMMUNICATIONS, INC.  
5480 GREAT AMERICA PARKWAY  
SANTA CLARA, CA 95054, U.S.A**

*Prepared by*  
**COMPLIANCE CERTIFICATION SERVICES  
47173 BENICIA STREET  
FREMONT, CA 94538, U.S.A.  
TEL: (510) 771-1000  
FAX: (510) 661-0888**



**NVLAP LAB CODE 200065-0**

Revision History

Rev.	Issue Date	Revisions	Revised By
--	07/08/08	Initial Issue	T. Chan
A	07/23/08	Updated Antenna Gain	T. Chan

## TABLE OF CONTENTS

<b>1. ATTESTATION OF TEST RESULTS</b>	<b>5</b>
<b>2. TEST METHODOLOGY</b>	<b>6</b>
<b>3. FACILITIES AND ACCREDITATION</b>	<b>6</b>
<b>4. CALIBRATION AND UNCERTAINTY</b>	<b>6</b>
4.1. MEASURING INSTRUMENT CALIBRATION	6
4.2. MEASUREMENT UNCERTAINTY	6
<b>5. EQUIPMENT UNDER TEST</b>	<b>7</b>
5.1. DESCRIPTION OF EUT	7
5.2. DESCRIPTION OF CLASS II CHANGE	7
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	7
5.4. SOFTWARE AND FIRMWARE	7
5.5. WORST-CASE CONFIGURATION AND MODE	7
5.6. DESCRIPTION OF TEST SETUP	8
<b>6. TEST AND MEASUREMENT EQUIPMENT</b>	<b>10</b>
<b>7. ANTENNA PORT TEST RESULTS</b>	<b>11</b>
7.1. 802.11a DUAL CHAIN LEGACY MODE IN THE UPPER 5.2 GHz BAND	11
7.1.1. AVERAGE POWER	11
7.2. 802.11n HT20 MODE IN THE UPPER 5.2 GHz BAND	12
7.2.1. AVERAGE POWER	12
<b>8. RADIATED TEST RESULTS</b>	<b>13</b>
8.1. LIMITS AND PROCEDURE	13
8.2. TRANSMITTER ABOVE 1 GHz (FEM #1)	14
8.2.1. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE LOWER 5.2 GHz BAND	14
8.2.2. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE LOWER 5.2 GHz BAND	19
1. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE LOWER 5.2 GHz BAND	22
8.2.3. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE UPPER 5.2 GHz BAND	25
8.2.4. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE UPPER 5.2 GHz BAND	30
8.2.5. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE UPPER 5.2 GHz BAND	33
8.2.6. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE 5.6 GHz BAND	36
8.2.7. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 5.6 GHz BAND	45

8.2.8.	TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE 5.6 GHz BAND	50
8.3.	TRANSMITTER ABOVE 1 GHz (FEM #2)	55
8.3.1.	TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE LOWER 5.2 GHz BAND	55
8.3.2.	TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE LOWER 5.2 GHz BAND	61
8.3.3.	TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE UPPER 5.2 GHz BAND	63
8.3.4.	TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE UPPER 5.2 GHz BAND	67
8.3.5.	TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE UPPER 5.2 GHz BAND	69
8.3.6.	TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE 5.6 GHz BAND	71
8.3.7.	TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 5.6 GHz BAND	79
8.3.8.	TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE 5.6 GHz BAND	83
8.4.	RECEIVER ABOVE 1 GHz WORST CASE	87
8.5.	WORST-CASE BELOW 1 GHz	88
9.	AC POWER LINE CONDUCTED EMISSIONS	90
10.	MAXIMUM PERMISSIBLE EXPOSURE	94
11.	SETUP PHOTOS	98

## 1. ATTESTATION OF TEST RESULTS

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

**EUT DESCRIPTION:** 802.11n 2x2 PCIe Minicard Transceiver

**FCC/IC MODEL:** AR5BXB92

**SERIAL NUMBER:** XB92-040-S0660

**DATE TESTED:** JUNE 19-28, 2008

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart E	Pass
INDUSTRY CANADA RSS-210 Issue 7 Annex 9	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:

Tested By:



THU CHAN  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

TOM CHEN  
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 2x2 PCIe minicard transceiver, FCC/IC model AR5BXB92. Two front-end module parts were evaluated; Vendors are SiGe (FEM1) and Hitachi (FEM2).

The radio module is manufactured by Atheros Communications, Inc.

### **5.2. DESCRIPTION OF CLASS II CHANGE**

The change filed under this application is added WNC Dipole Antenna.

### **5.3. DESCRIPTION OF AVAILABLE ANTENNAS**

The radio utilizes a Dipole antenna, with a peak gain of 1.86dBi for 5150-5250 MHz Band, 2.39dBi for 5250-5350 MHz Band, and 2.69dBi for 5500-5700MHz Band.

### **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**

The 2x2 configuration was used for all testing in this report, and all emissions tests were made with following data rates:

- 802.11b mode, 20 MHz Channel Bandwidth, 1 Mb/s, CCK Modulation, Spatial Stream 1.
- 802.11g mode, 20 MHz Channel Bandwidth, 9 Mb/s, OFDM Modulation, Spatial Stream 1.
- 802.11a mode, 20 MHz Channel Bandwidth, 9 Mb/s, OFDM Modulation, Spatial Stream 1.
- 802.11n HT20 mode, 20 MHz Channel Bandwidth, MCS0, 6.5 Mb/s, OFDM Modulation, Spatial Stream 1.
- 802.11n HT40 mode, 40 MHz Channel Bandwidth, MCS0, 13.5 Mb/s, OFDM Modulation, Spatial Stream 1.

Baseline testing on both FEM #1 (SiGe) and FEM#2 (Hitachi), Vertical Polarization is determined to be the worst case.

For RF radiated emissions, all tests were performed on FEM1 boards.

For radiated emissions bandedge, both FEM1 and FEM2 boards were performed.

For radiated emissions TX below 1 GHz, RX spurious, and AC line conduction were performed at FEM1 board.

For 5.3GHz Band, a mode, at vertical polarization, in order to pass high channel band edge, power is reduced to ~14dBm for high channel, no change on low and mid channels.

For 5.3GHz Band, HT20 mode, at vertical polarization, in order to pass high channel band edge, power is reduced to ~13.5dBm for high channel, no change on low and mid channels.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	IBM	ThinkPad T43	L3-BR298	DoC
AC Adapter	IBM	08K8204	11S08K8204Z1ZAC85911A	DoC

### I/O CABLES

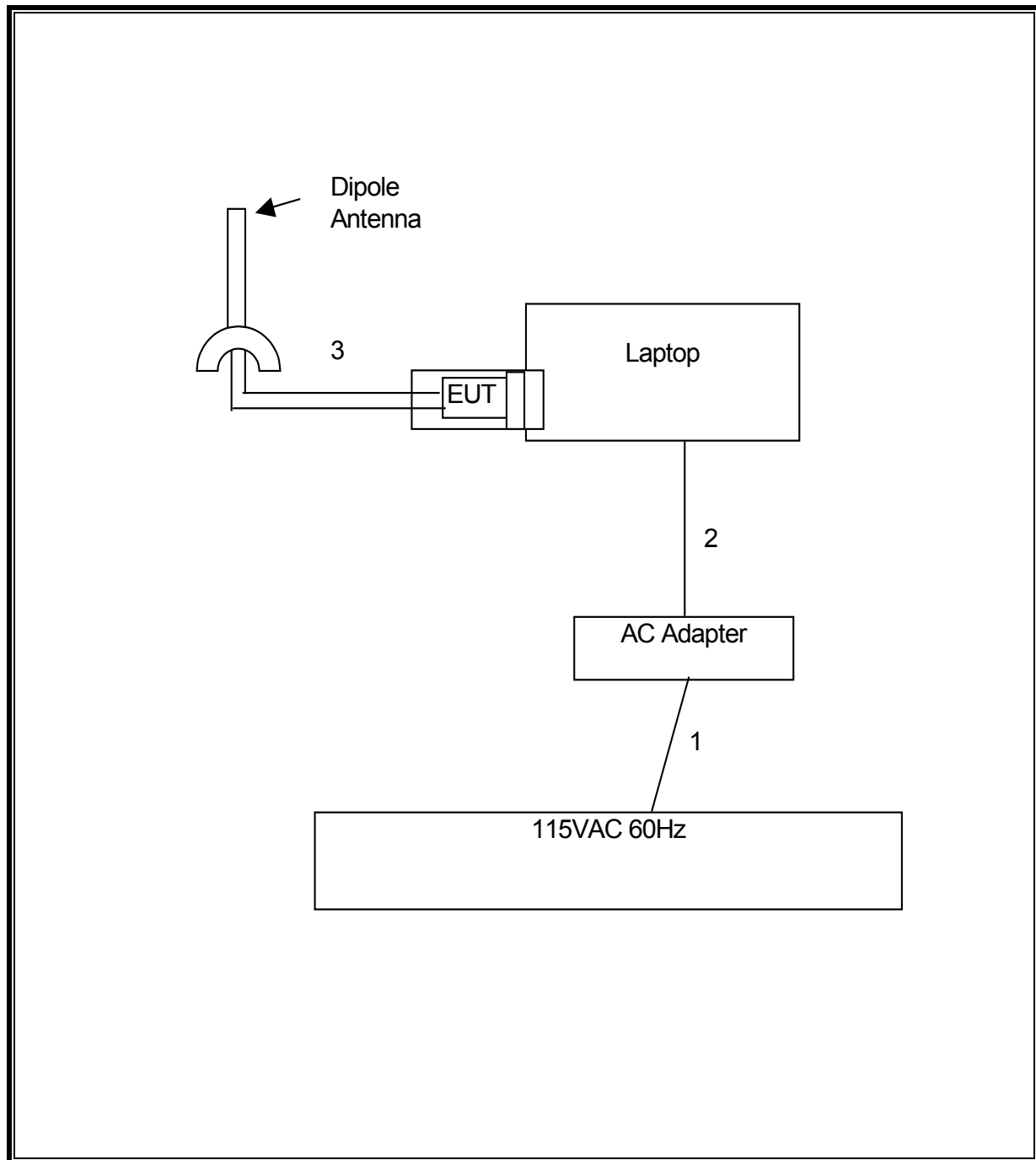
I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Un-shielded	2m	NA
2	DC	1	DC	Un-shielded	2m	NA
3	Antenna Port	1	RSMA Plug	Un-shielded	1m	NA

### TEST SETUP

The EUT is connected to a laptop PC via a PCI extension card during the tests. Test software exercised the radio card.



**SETUP DIAGRAM FOR TESTS**



## 6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST					
Description	Manufacturer	Model	Asset	Cal Date	Cal Due
Antenna, Horn, 18 GHz	EMCO	3115	C00945	4/15/2007	4/22/2009
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	6/19/2009
RF Filter Section, 2.9 GHz	Agilent / HP	85420E	C00958	2/6/2007	6/19/2009
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
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	9/29/2007	9/29/2008
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	10/11/2007	10/11/2008
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
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	10/11/2007	10/11/2008
2.4-2.5GHz Reject Filter	Micro Tronics	BRM50702	N02685	CNR	CNR
Reject Filter, 5.15-5.35 GHz	Micro-Tronics	BRC13190	N02679	CNR	CNR
Reject Filter, 5.47-5.725 GHz	Micro-Tronics	BRC13191	N02678	CNR	CNR
Reject Filter, 5.725-5.85 GHz	Micro-Tronics	BRC13192	N02676	CNR	CNR

## 7. ANTENNA PORT TEST RESULTS

### 7.1. 802.11a DUAL CHAIN LEGACY MODE IN THE UPPER 5.2 GHz BAND

#### 7.1.1. 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 17.2 dB (including 16 dB pad and 1.2 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
*5320	14.10	14.00	17.06

\*In order to pass high channel band edge, power is reduced to ~14dBm, no change on low-band and mid-band channels.

## **7.2. 802.11n HT20 MODE IN THE UPPER 5.2 GHz BAND**

### **7.2.1. 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 17.2 dB (including 16 dB pad and 1.2 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
*5320	13.50	13.50	16.51

\*In order to pass high channel band edge, power is reduced to ~13.5dBm, no change on low-band and mid-band channels.

## 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 ( $\mu$ V/m) at 3 m	Field Strength Limit (dB $\mu$ V/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.

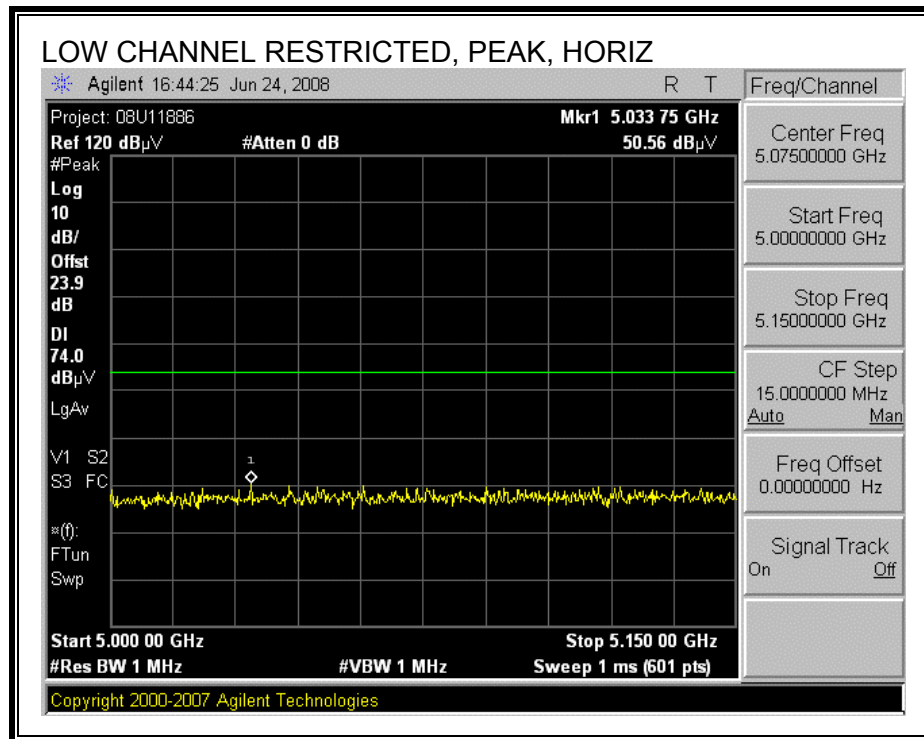
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

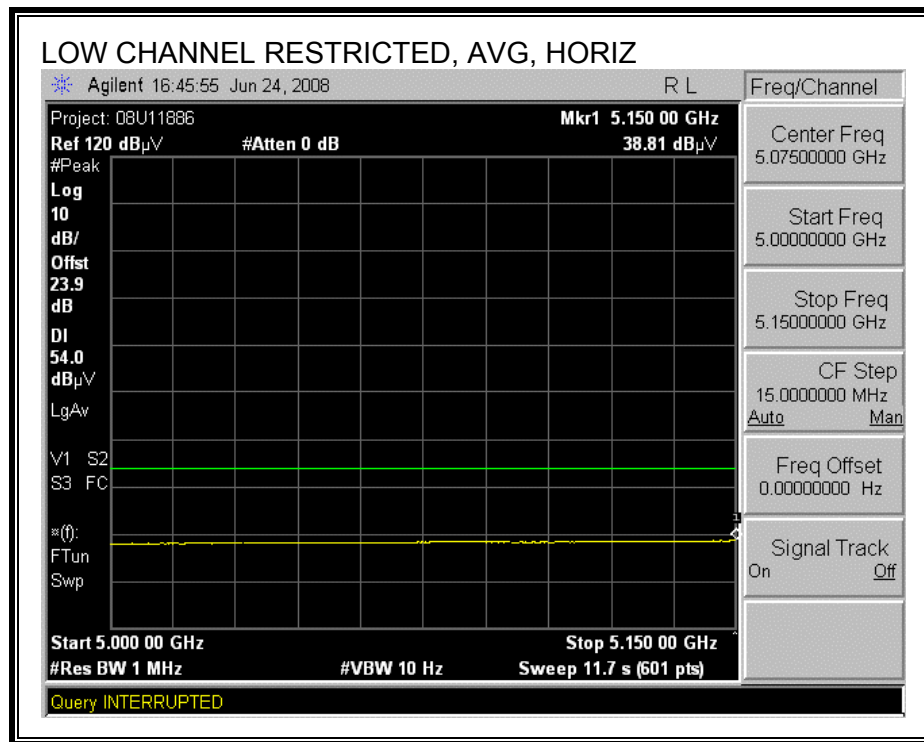
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

## 8.2. TRANSMITTER ABOVE 1 GHz (FEM #1)

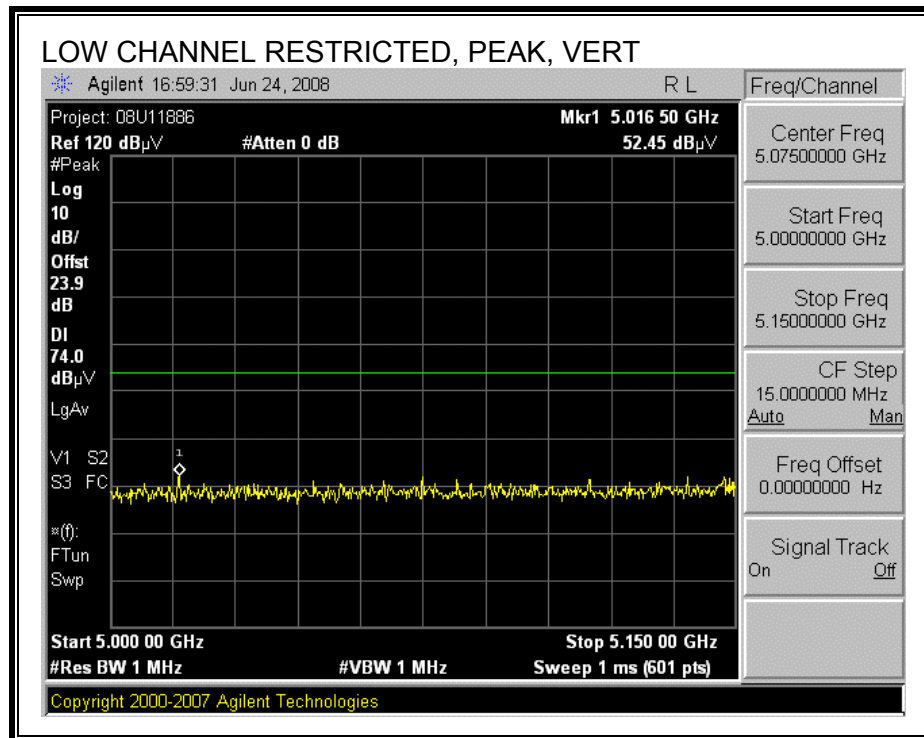
### 8.2.1. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE LOWER 5.2 GHz BAND

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

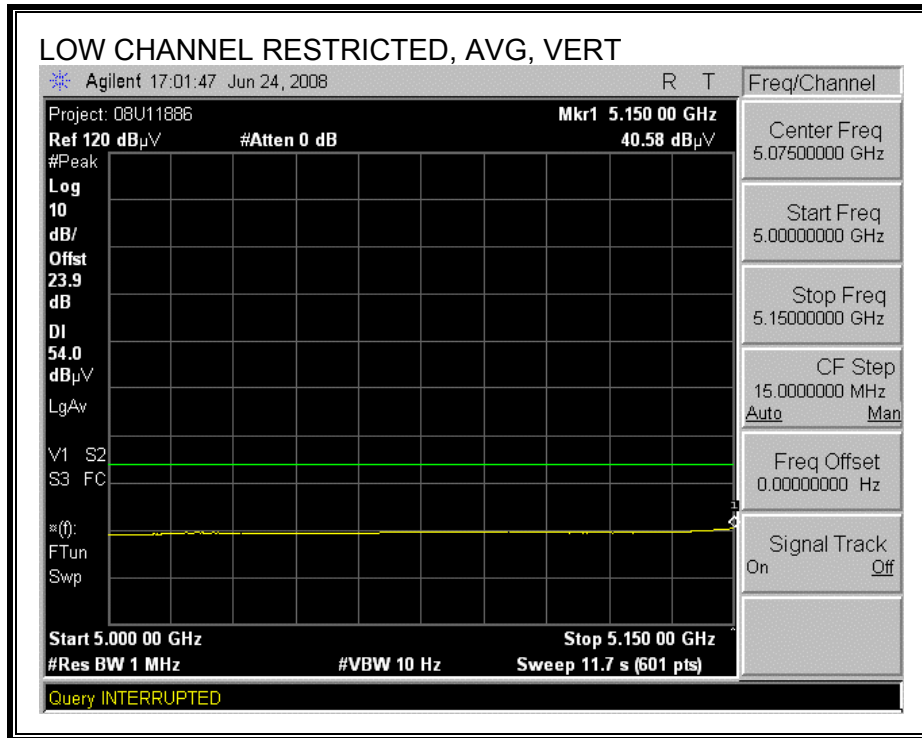




**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**





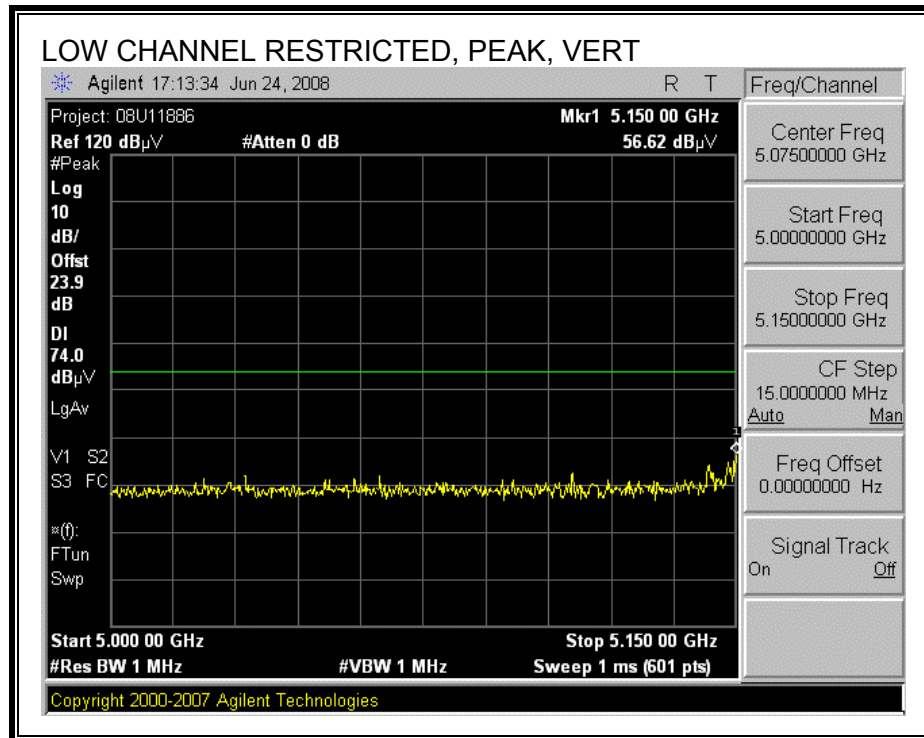


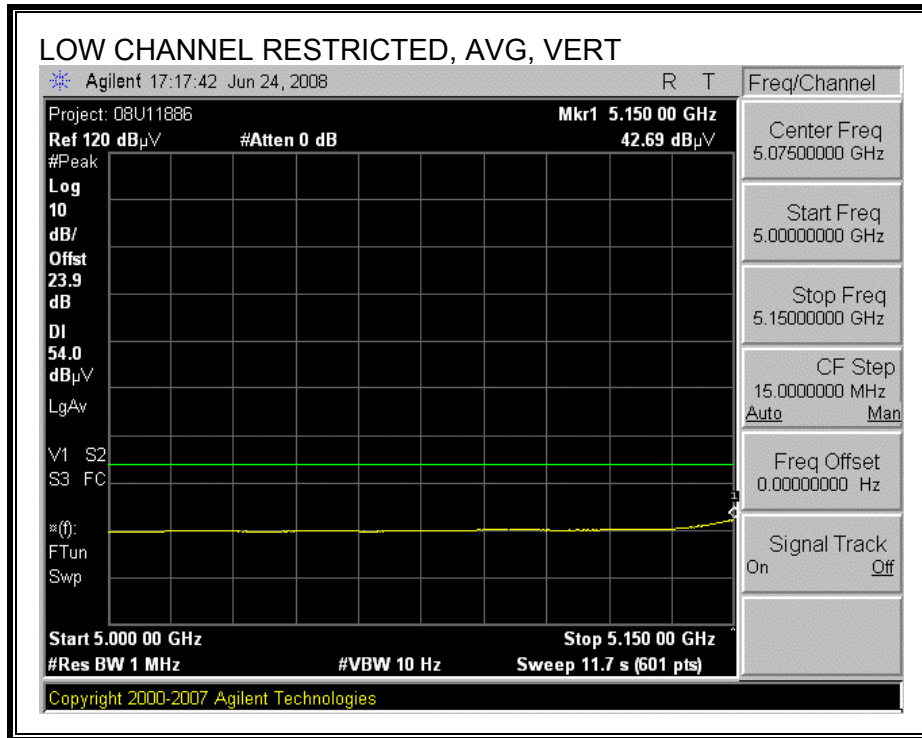
## HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement																
Compliance Certification Services, Fremont 5m Chamber																
Company: Atheros Communications, Inc.																
Project #: 08U11886																
Date: 6/25/2008																
Test Engineer: Tom Chen																
Configuration: EUT with Laptop																
Mode: a Mode, Tx On (Polarization worst case: Vertical)																
Test Equipment:																
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit				
T60; S/N: 2238 @3m			T145 Agilent 3008A0050									FCC 15.205				
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	
						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)	
Low Ch. 5180 MHz																
15.540	3.0	41.2	21.2	38.0	0.0	-32.3	0.0	0.0	46.9	26.9	74	54	-27.1	-27.1	H	
15.540	3.0	42.5	22.5	38.0	0.0	-32.3	0.0	0.0	48.2	28.2	74	54	-25.8	-25.8	V	
Mid Ch. 5220 MHz																
15.660	3.0	44.5	24.5	37.9	0.0	-32.3	0.0	0.0	50.2	30.2	74	54	-23.8	-23.8	V	
High Ch. 5240 MHz																
15.720	3.0	43.5	23.5	37.9	0.0	-32.3	0.0	0.0	49.2	29.2	74	54	-24.8	-24.8	V	
															V	
															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											

## 8.2.2. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE LOWER 5.2 GHz BAND

### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



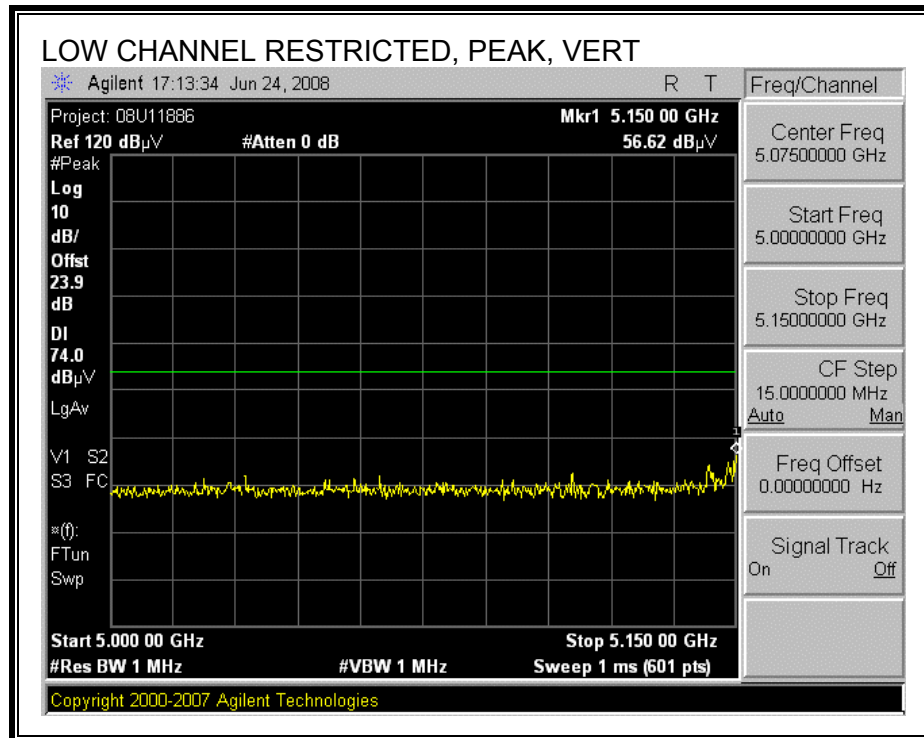


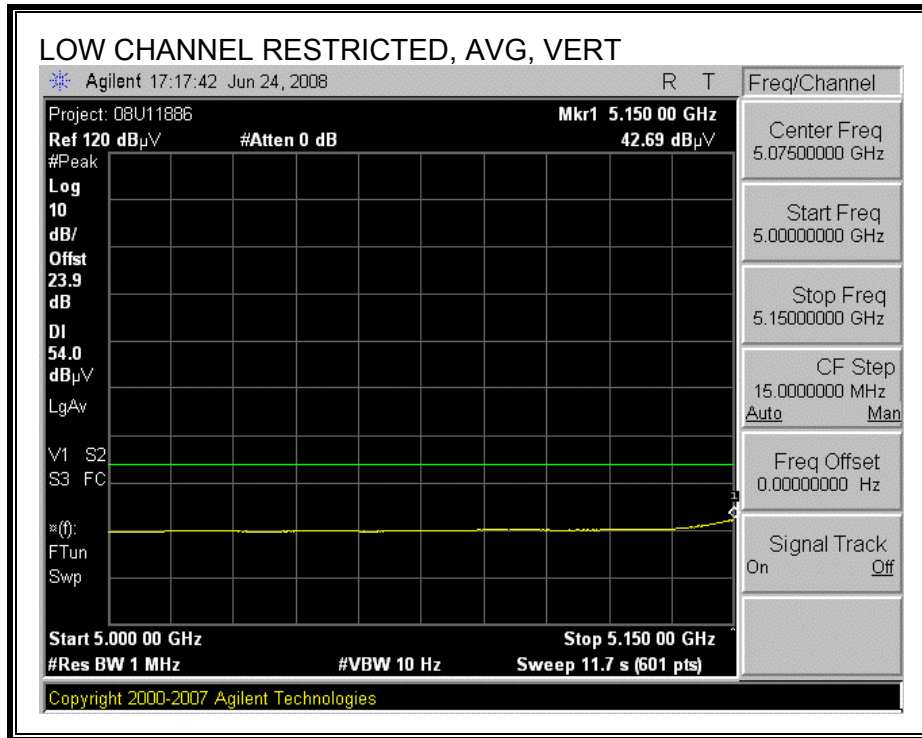
## HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement																
Compliance Certification Services, Fremont 5m Chamber																
Company: Atheros Communications, Inc.																
Project #: 08U11886																
Date: 6/25/2008																
Test Engineer: Tom Chen																
Configuration: EUT with Laptop																
Mode: HT20 Mode, Tx On (Polarization worst case: Vertical)																
Test Equipment:																
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit				
T60; S/N: 2238 @3m			T145 Agilent 3008A0050									FCC 15.205				
Hi Frequency Cables																
2 foot cable			3 foot cable			12 foot cable			HPF			Reject Filter			Peak Measurements RBW=VBW=1MHz	
						C-5m Chamber						R_001			Average Measurements RBW=1MHz ; VBW=10Hz	
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)	
Low Ch. 5180 MHz																
15.540	3.0	42.0	22.0	38.0	0.0	-32.3	0.0	0.0	47.7	27.7	74	54	-26.3	-26.3	H	
15.540	3.0	43.1	23.1	38.0	0.0	-32.3	0.0	0.0	48.8	28.8	74	54	-25.2	-25.2	V	
Mid Ch. 5220 MHz																
15.660	3.0	42.5	22.5	37.9	0.0	-32.3	0.0	0.0	48.2	28.2	74	54	-25.8	-25.8	V	
High Ch. 5240 MHz																
15.720	3.0	42.1	22.1	37.9	0.0	-32.3	0.0	0.0	47.8	27.8	74	54	-26.2	-26.2	V	
															V	
															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											

# 1. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE LOWER 5.2 GHz BAND

## RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





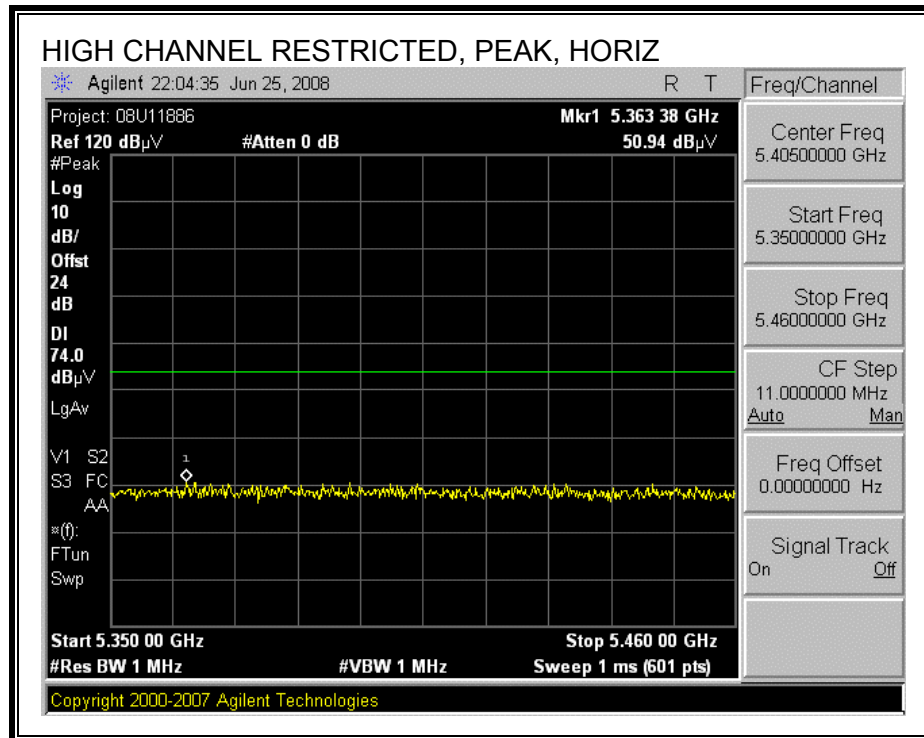
## HARMONICS AND SPURIOUS EMISSIONS

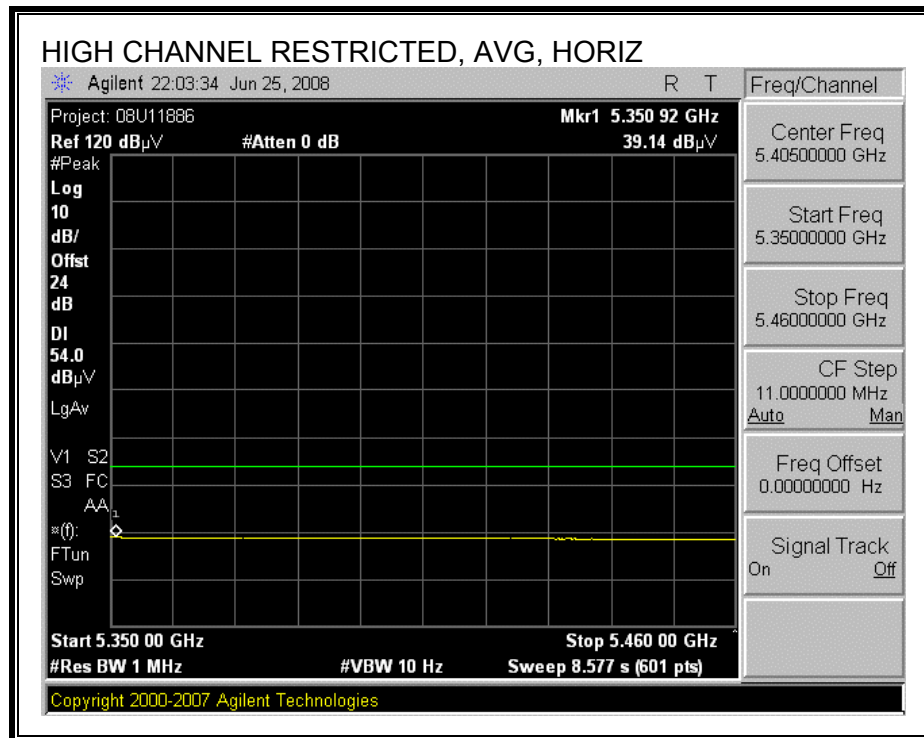
High Frequency Measurement																
Compliance Certification Services, Fremont 5m Chamber																
Company: Atheros Communications, Inc.																
Project #: 08U11886																
Date: 6/25/2008																
Test Engineer: Tom Chen																
Configuration: EUT with Laptop																
Mode: HT40 Mode, Tx On (Polarization worst case: Vertical)																
Test Equipment:																
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit				
T60; S/N: 2238 @3m			T145 Agilent 3008A0050									FCC 15.205				
Hi Frequency Cables																
2 foot cable			3 foot cable			12 foot cable			HPF			Reject Filter			Peak Measurements	
						C-5m Chamber						R_001			RBW=VBW=1MHz	
Average Measurements																
RBW=1MHz ; VBW=10Hz																
f	Dist	Read Pk	Read Avg.	AF	CL	Amp	D Corr	Fldr	Peak	Avg	Pk Lim	Avg Lim	Pk Mar	Avg Mar	Notes	
GHz	(m)	dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)	
Low Ch. 5190 MHz																
15.570	3.0	41.1	21.1	38.0	0.0	-32.3	0.0	0.0	46.8	26.8	74	54	-27.2	-27.2	H	
15.570	3.0	42.5	22.5	38.0	0.0	-32.3	0.0	0.0	48.2	28.2	74	54	-25.8	-25.8	V	
High Ch. 5230 MHz																
15.690	3.0	43.2	23.2	37.9	0.0	-32.3	0.0	0.0	48.9	28.9	74	54	-25.1	-25.1	V	
															V	
															H	
															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									



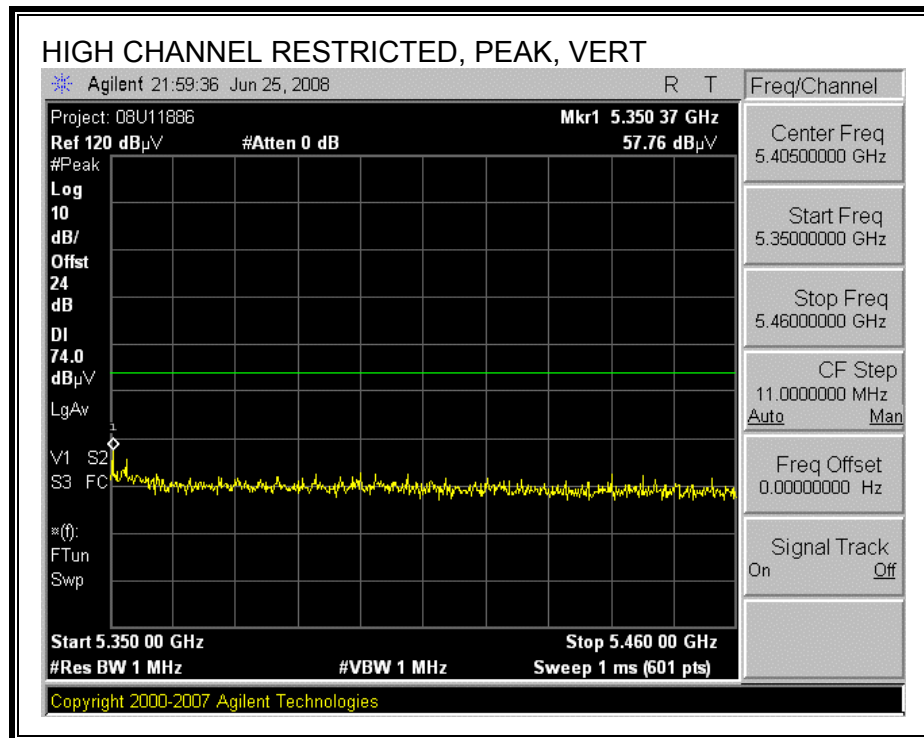
### 8.2.3. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE UPPER 5.2 GHz BAND

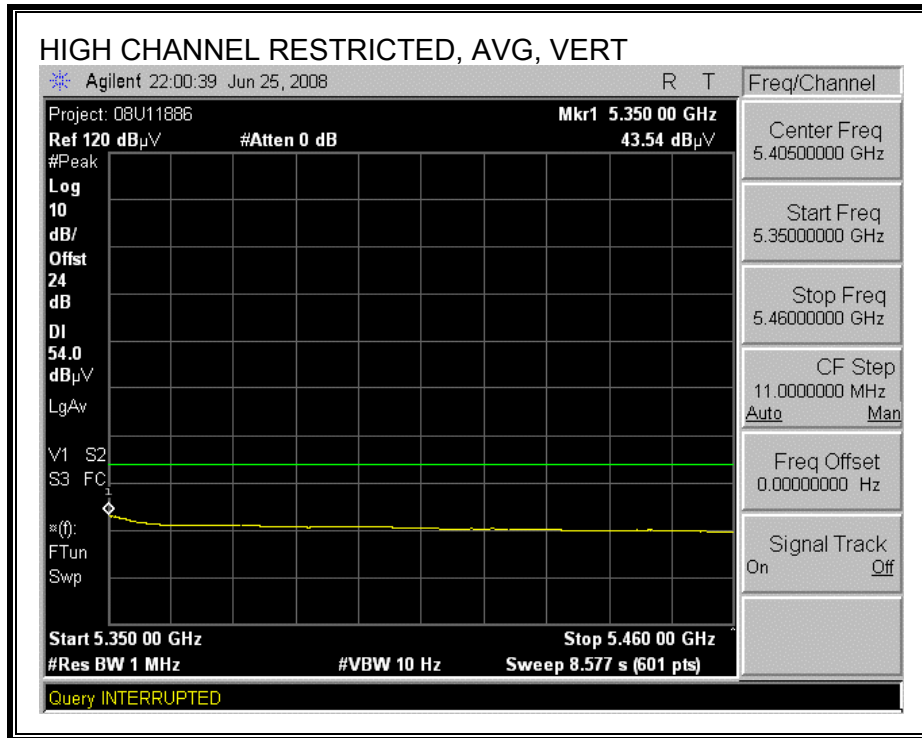
#### RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





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



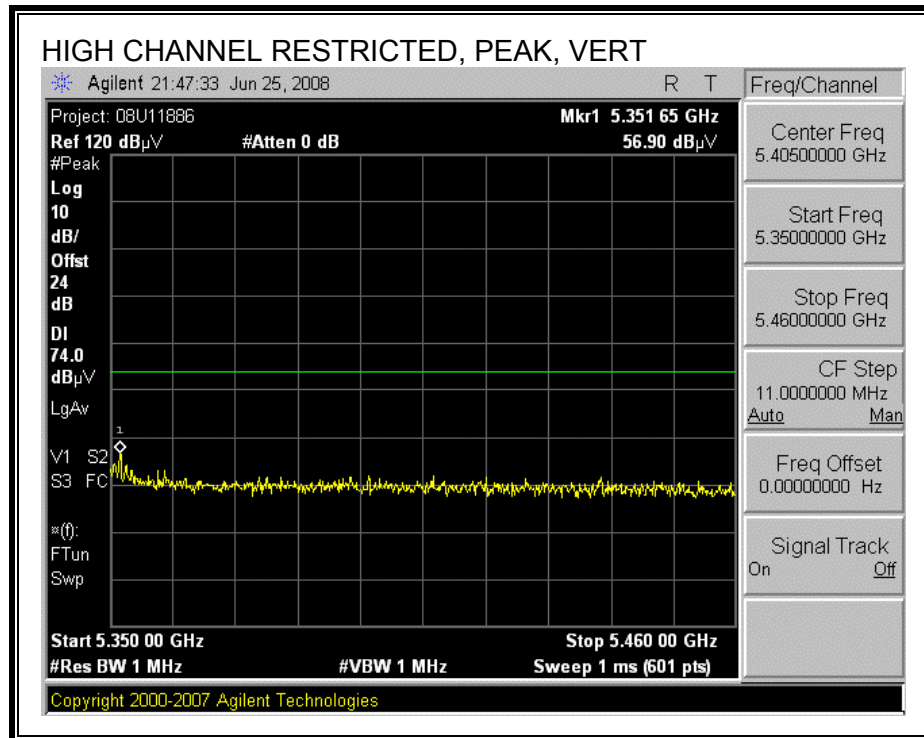


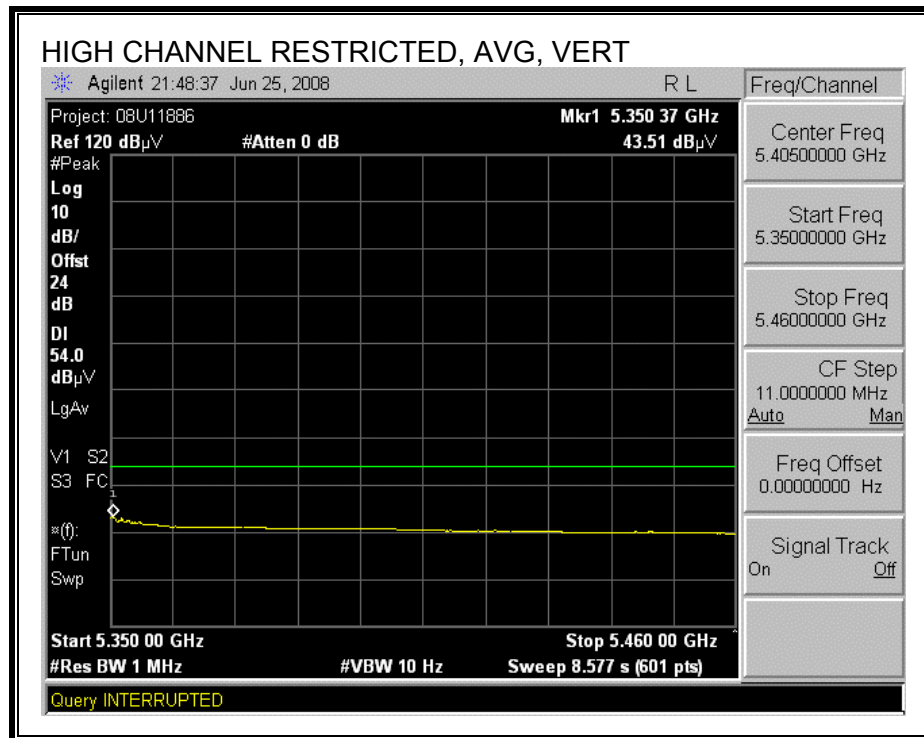
## HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement																
Compliance Certification Services, Fremont 5m Chamber																
Company: Atheros Communications, Inc.																
Project #: 08U11886																
Date: 6/25/2008																
Test Engineer: Tom Chen																
Configuration: EUT with Laptop																
Mode: a Mode, Tx On (Polarization worst case: Vertical)																
Test Equipment:																
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit				
T60; S/N: 2238 @3m			T145 Agilent 3008A0050									FCC 15.205				
Hi Frequency Cables																
2 foot cable			3 foot cable			12 foot cable			HPF			Reject Filter			Peak Measurements	
						C-5m Chamber						R_001			RBW=VBW=1MHz	
Average Measurements																
RBW=1MHz ; VBW=10Hz																
f	Dist	Read Pk	Read Avg.	AF	CL	Amp	D Corr	Fctr	Peak	Avg	Pk Lim	Avg Lim	Pk Mar	Avg Mar	Notes	
GHz	(m)	dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)	
Low Ch. 5260 MHz																
15.780	3.0	41.0	21.0	37.9	0.0	-32.2	0.0	0.0	46.7	26.7	74	54	-27.3	-27.3	H	
15.780	3.0	43.5	23.5	37.9	0.0	-32.2	0.0	0.0	49.2	29.2	74	54	-24.8	-24.8	V	
Mid Ch. 5300 MHz																
10.600	3.0	41.0	21.0	37.4	0.0	-34.3	0.0	0.0	44.1	24.1	74	54	-29.9	-29.9	V	
15.900	3.0	45.1	25.1	37.9	0.0	-32.2	0.0	0.0	50.7	30.7	74	54	-23.3	-23.3	V	
High Ch. 5320 MHz																
10.640	3.0	41.0	21.0	37.3	0.0	-34.2	0.0	0.0	44.1	24.1	74	54	-29.9	-29.9	V	
15.960	3.0	43.1	23.1	37.8	0.0	-32.2	0.0	0.0	48.7	28.7	74	54	-25.3	-25.3	V	
															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												

## 8.2.4. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE UPPER 5.2 GHz BAND

### RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





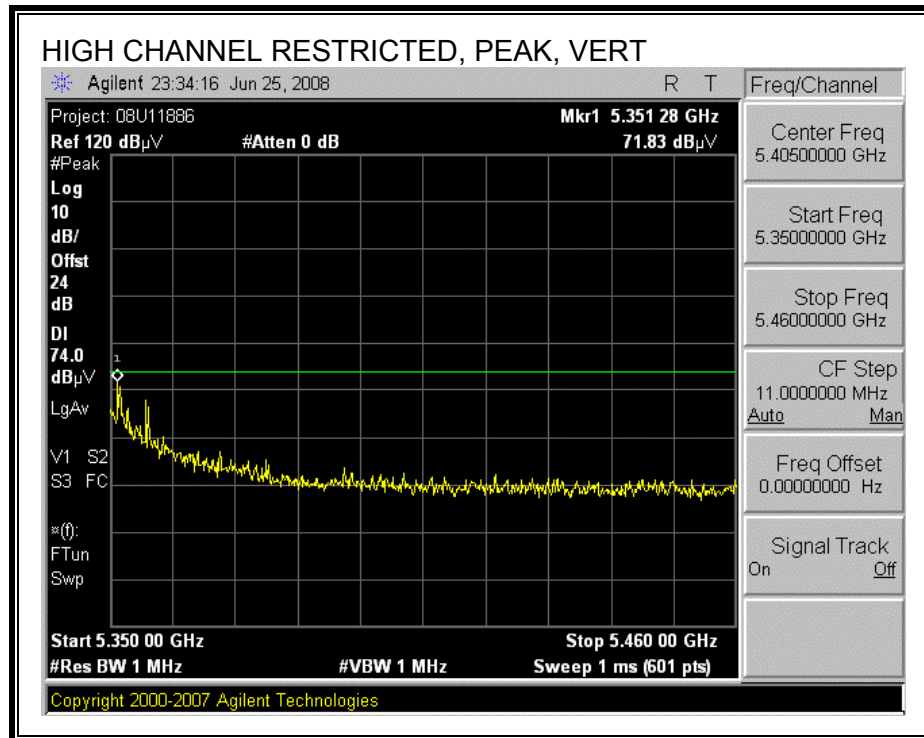
## HARMONICS AND SPURIOUS EMISSIONS

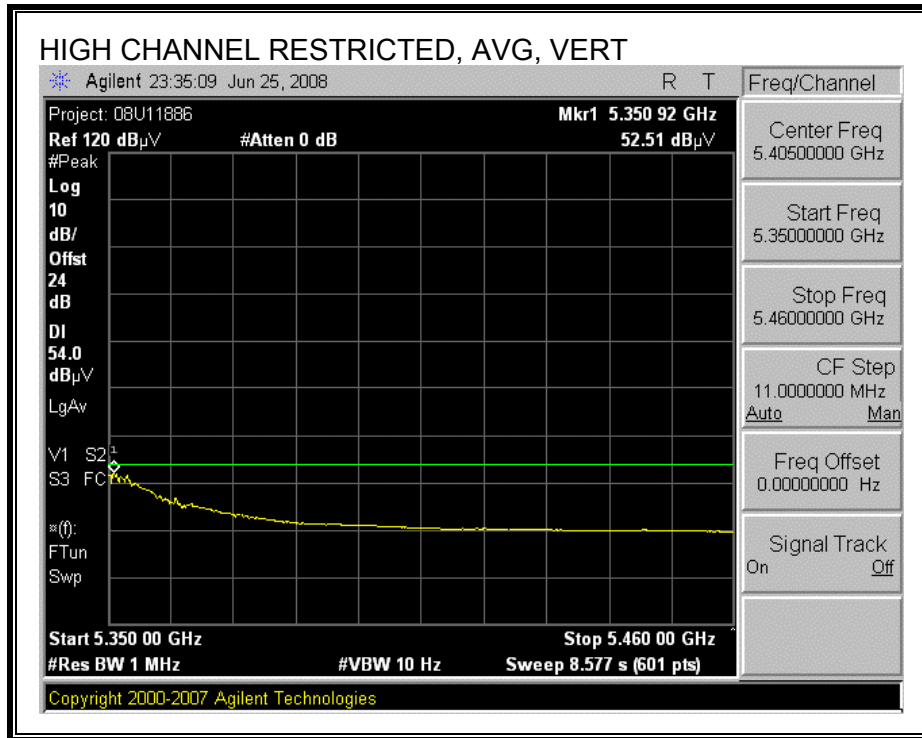
High Frequency Measurement																
Compliance Certification Services, Fremont 5m Chamber																
Company: Atheros Communications, Inc.																
Project #: 08U11886																
Date: 6/25/2008																
Test Engineer: Tom Chen																
Configuration: EUT with Laptop																
Mode: HT20 Mode, Tx On (Polarization worst case: Vertical)																
Test Equipment:																
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit				
T60; S/N: 2238 @3m			T145 Agilent 3008A0050									FCC 15.205				
Hi Frequency Cables																
2 foot cable			3 foot cable			12 foot cable			HPF			Reject Filter			Peak Measurements	
						C-5m Chamber						R_001			RBW=VBW=1MHz	
Average Measurements																
RBW=1MHz; VBW=10Hz																
f	Dist	Read Pk	Read Avg.	AF	CL	Amp	D Corr	Fctr	Peak	Avg	Pk Lim	Avg Lim	Pk Mar	Avg Mar	Notes	
GHz	(m)	dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)	
Low Ch. 5260 MHz																
15.780	3.0	56.8	42.5	37.9	0.0	-32.2	0.0	0.0	62.5	48.2	74	54	-11.5	-5.8	H	
15.780	3.0	59.2	44.8	37.9	0.0	-32.2	0.0	0.0	64.9	50.5	74	54	-9.1	-3.5	V	
Mid Ch. 5300 MHz																
10.600	3.0	45.2	31.8	37.4	0.0	-34.3	0.0	0.0	48.3	34.9	74	54	-25.7	-19.1	V	
15.900	3.0	57.6	43.9	37.9	0.0	-32.2	0.0	0.0	63.2	49.5	74	54	-10.8	-4.5	V	
High Ch. 5320 MHz																
10.640	3.0	41.0	21.0	37.3	0.0	-34.2	0.0	0.0	44.1	24.1	74	54	-29.9	-29.9	V	
15.960	3.0	43.1	23.1	37.8	0.0	-32.2	0.0	0.0	48.7	28.7	74	54	-25.3	-25.3	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												



## 8.2.5. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE UPPER 5.2 GHz BAND

### RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

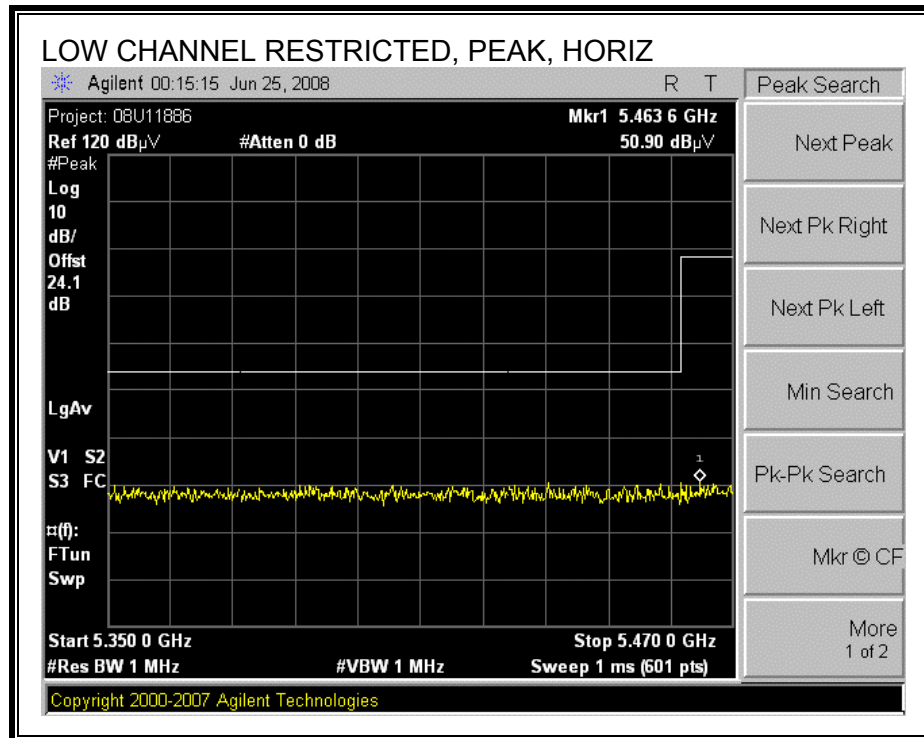


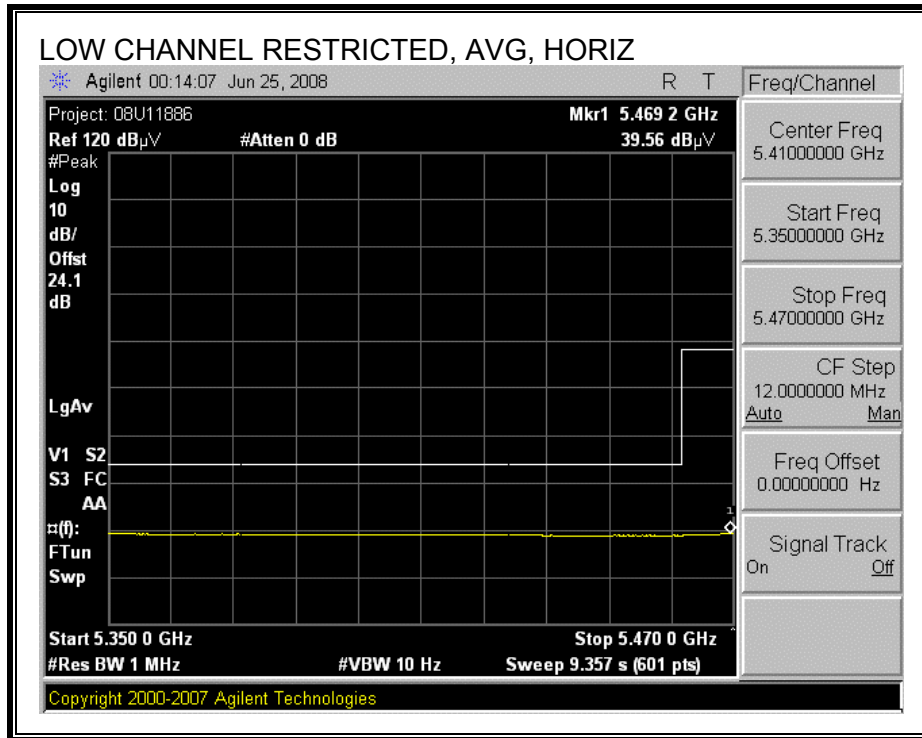


<b>High Frequency Measurement</b> Compliance Certification Services, Fremont 5m Chamber  Company: Atheros Communications, Inc. Project #: 08U11886 Date: 6/25/2008 Test Engineer: Tom Chen Configuration: EUT with Laptop Mode: HT20 Mode, Tx On (Polarization worst case: Vertical)																																																																																																																																																																															
<b>Test Equipment:</b>																																																																																																																																																																															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz				Limit																																																																																																																																																																					
<div>T60; S/N: 2238 @3m ▾</div>		<div>T145 Agilent 3008A0050 ▾</div>		<div>▾</div>		<div>▾</div>				<div>FCC 15.205 ▾</div>																																																																																																																																																																					
Hi Frequency Cables																																																																																																																																																																															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter																																																																																																																																																																							
<div>▾</div>		<div>▾</div>		<div>C-5m Chamber ▾</div>		<div>▾</div>		<div>R_001 ▾</div>																																																																																																																																																																							
<table border="1" style="width: 100%; border-collapse: collapse; font-size: small;"> <thead> <tr> <th>f GHz</th> <th>Dist (m)</th> <th>Read Pk dBuV</th> <th>Read Avg. dBuV</th> <th>AF dB/m</th> <th>CL dB</th> <th>Amp dB</th> <th>D Corr dB</th> <th>Filtr dB</th> <th>Peak dBuV/m</th> <th>Avg dBuV/m</th> <th>Pk Lim dBuV/m</th> <th>Avg Lim dBuV/m</th> <th>Pk Mar dB</th> <th>Avg Mar dB</th> <th>Notes (V/H)</th> </tr> </thead> <tbody> <tr> <td colspan="16"><b>Low Ch. 52.70 MHz</b></td> </tr> <tr> <td>15.810</td> <td>3.0</td> <td>51.5</td> <td>39.3</td> <td>37.9</td> <td>0.0</td> <td>-32.2</td> <td>0.0</td> <td>0.0</td> <td>57.1</td> <td>44.9</td> <td>74</td> <td>54</td> <td>-16.9</td> <td>-9.1</td> <td>H</td> </tr> <tr> <td>15.810</td> <td>3.0</td> <td>53.9</td> <td>41.4</td> <td>37.9</td> <td>0.0</td> <td>-32.2</td> <td>0.0</td> <td>0.0</td> <td>59.5</td> <td>47.0</td> <td>74</td> <td>54</td> <td>-14.5</td> <td>-7.0</td> <td>V</td> </tr> <tr> <td colspan="16"><b>High Ch. 53.10 MHz</b></td> </tr> <tr> <td>10.620</td> <td>3.0</td> <td>41.3</td> <td>21.3</td> <td>37.4</td> <td>0.0</td> <td>-34.3</td> <td>0.0</td> <td>0.0</td> <td>44.4</td> <td>24.4</td> <td>74</td> <td>54</td> <td>-29.6</td> <td>-29.6</td> <td>V</td> </tr> <tr> <td>15.930</td> <td>3.0</td> <td>43.3</td> <td>23.3</td> <td>37.8</td> <td>0.0</td> <td>-32.2</td> <td>0.0</td> <td>0.0</td> <td>48.9</td> <td>28.9</td> <td>74</td> <td>54</td> <td>-25.1</td> <td>-25.1</td> <td>V</td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>																f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)	<b>Low Ch. 52.70 MHz</b>																15.810	3.0	51.5	39.3	37.9	0.0	-32.2	0.0	0.0	57.1	44.9	74	54	-16.9	-9.1	H	15.810	3.0	53.9	41.4	37.9	0.0	-32.2	0.0	0.0	59.5	47.0	74	54	-14.5	-7.0	V	<b>High Ch. 53.10 MHz</b>																10.620	3.0	41.3	21.3	37.4	0.0	-34.3	0.0	0.0	44.4	24.4	74	54	-29.6	-29.6	V	15.930	3.0	43.3	23.3	37.8	0.0	-32.2	0.0	0.0	48.9	28.9	74	54	-25.1	-25.1	V																																																
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)																																																																																																																																																																
<b>Low Ch. 52.70 MHz</b>																																																																																																																																																																															
15.810	3.0	51.5	39.3	37.9	0.0	-32.2	0.0	0.0	57.1	44.9	74	54	-16.9	-9.1	H																																																																																																																																																																
15.810	3.0	53.9	41.4	37.9	0.0	-32.2	0.0	0.0	59.5	47.0	74	54	-14.5	-7.0	V																																																																																																																																																																
<b>High Ch. 53.10 MHz</b>																																																																																																																																																																															
10.620	3.0	41.3	21.3	37.4	0.0	-34.3	0.0	0.0	44.4	24.4	74	54	-29.6	-29.6	V																																																																																																																																																																
15.930	3.0	43.3	23.3	37.8	0.0	-32.2	0.0	0.0	48.9	28.9	74	54	-25.1	-25.1	V																																																																																																																																																																
Rev. 4.12.7																																																																																																																																																																															
<b>Note: No other emissions were detected above the system noise floor</b>																																																																																																																																																																															
<table style="width: 100%;"> <tr> <td style="vertical-align: top; width: 33%;">           f      Measurement Frequency            Dist Distance to Antenna            Read Analyzer Reading            AF     Antenna Factor            CL     Cable Loss         </td> <td style="vertical-align: top; width: 33%;">           Amp Preamp Gain            D Corr Distance Correct to 3 meters            Avg Average Field Strength @ 3 m            Peak Calculated Peak Field Strength            HPF High Pass Filter         </td> <td style="vertical-align: top; width: 33%;">           Avg Lim Average Field Strength Limit            Pk Lim Peak Field Strength Limit            Avg Mar Margin vs. Average Limit            Pk Mar Margin vs. Peak Limit         </td> </tr> </table>																f      Measurement Frequency Dist Distance to Antenna Read Analyzer Reading AF     Antenna Factor CL     Cable Loss	Amp Preamp Gain D Corr Distance Correct to 3 meters Avg Average Field Strength @ 3 m Peak Calculated Peak Field Strength HPF High Pass Filter	Avg Lim Average Field Strength Limit Pk Lim Peak Field Strength Limit Avg Mar Margin vs. Average Limit Pk Mar Margin vs. Peak Limit																																																																																																																																																													
f      Measurement Frequency Dist Distance to Antenna Read Analyzer Reading AF     Antenna Factor CL     Cable Loss	Amp Preamp Gain D Corr Distance Correct to 3 meters Avg Average Field Strength @ 3 m Peak Calculated Peak Field Strength HPF High Pass Filter	Avg Lim Average Field Strength Limit Pk Lim Peak Field Strength Limit Avg Mar Margin vs. Average Limit Pk Mar Margin vs. Peak Limit																																																																																																																																																																													

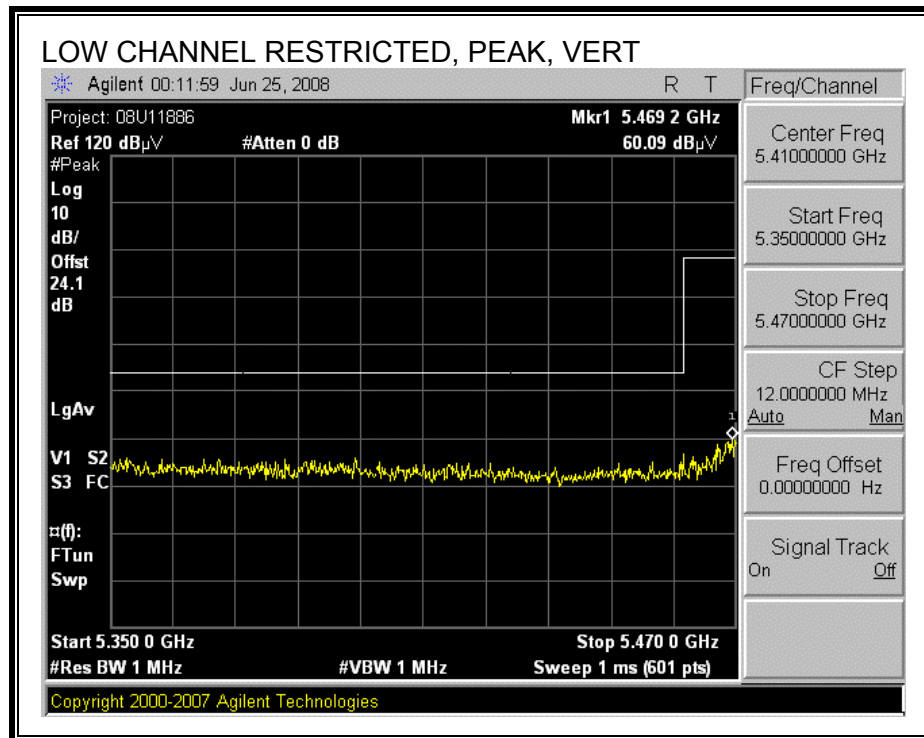
## 8.2.6. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE 5.6 GHz BAND

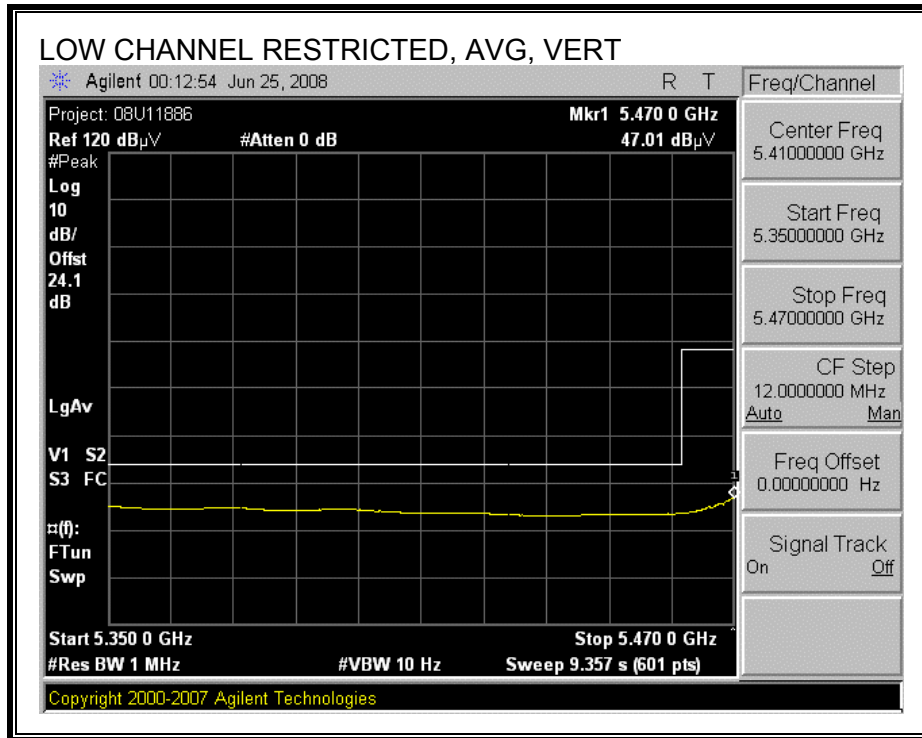
### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



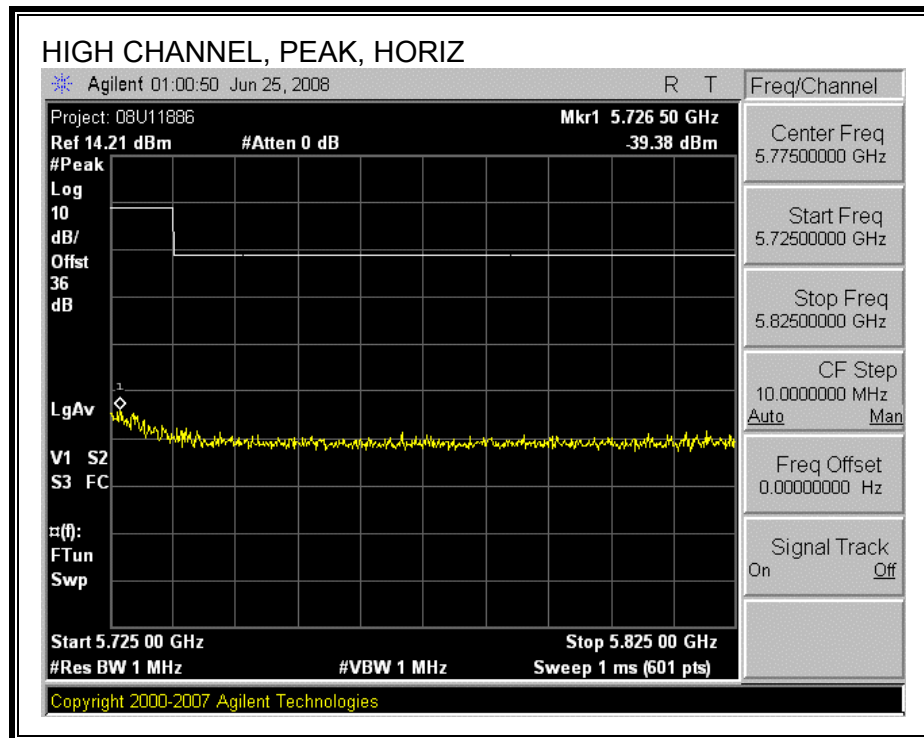


**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**

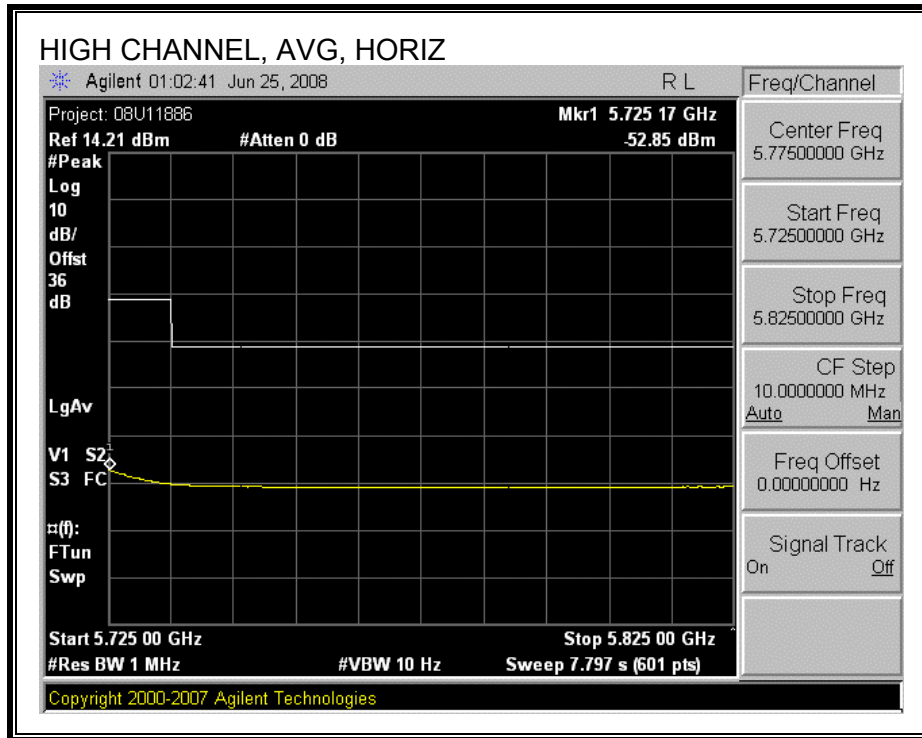




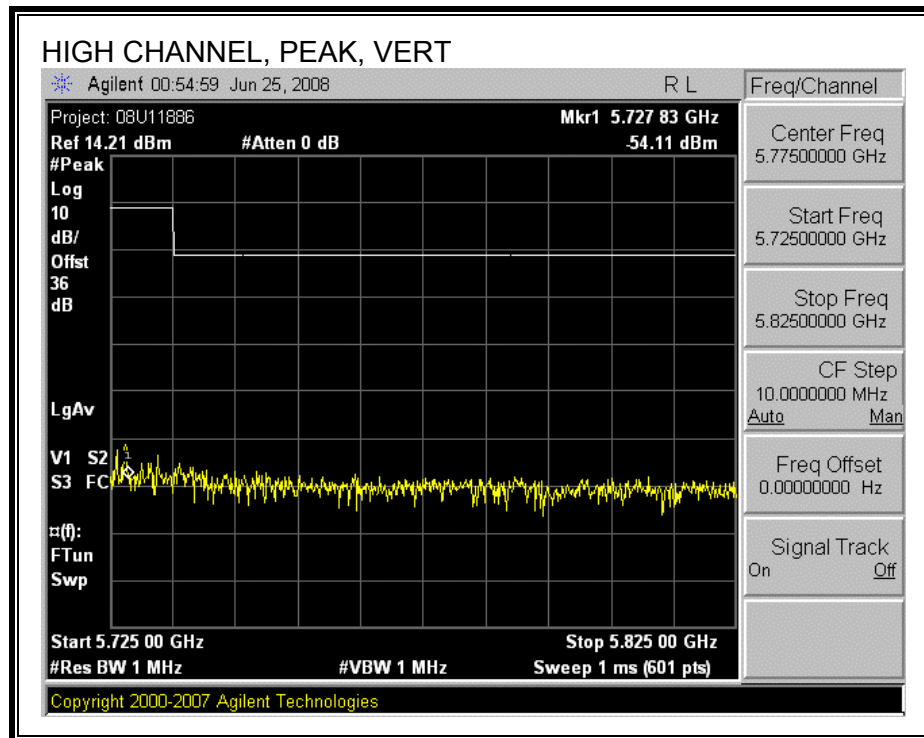
**AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

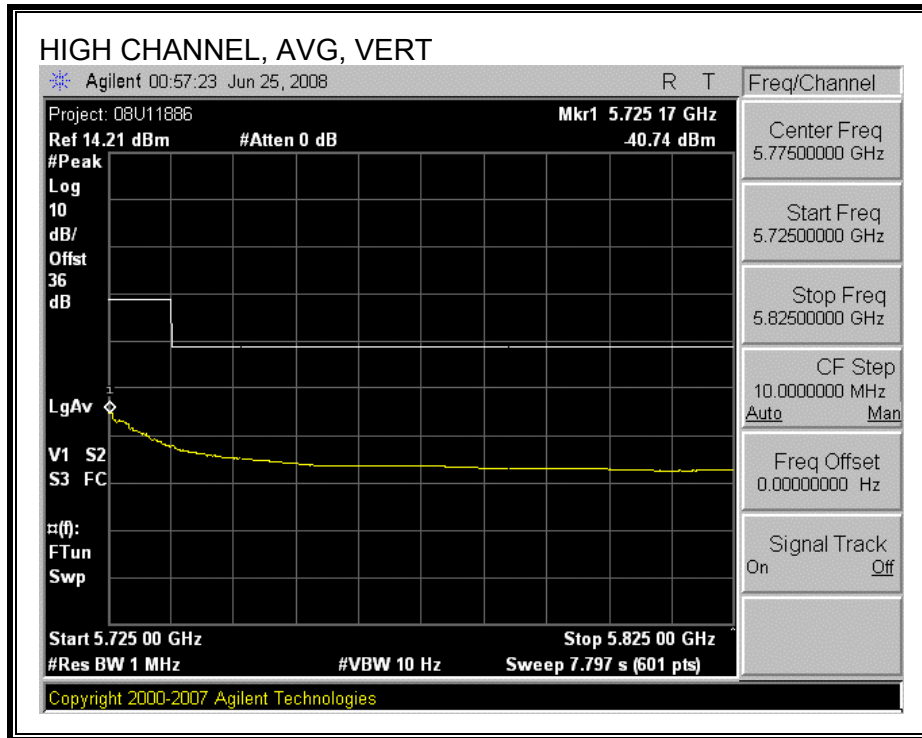






**AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)**



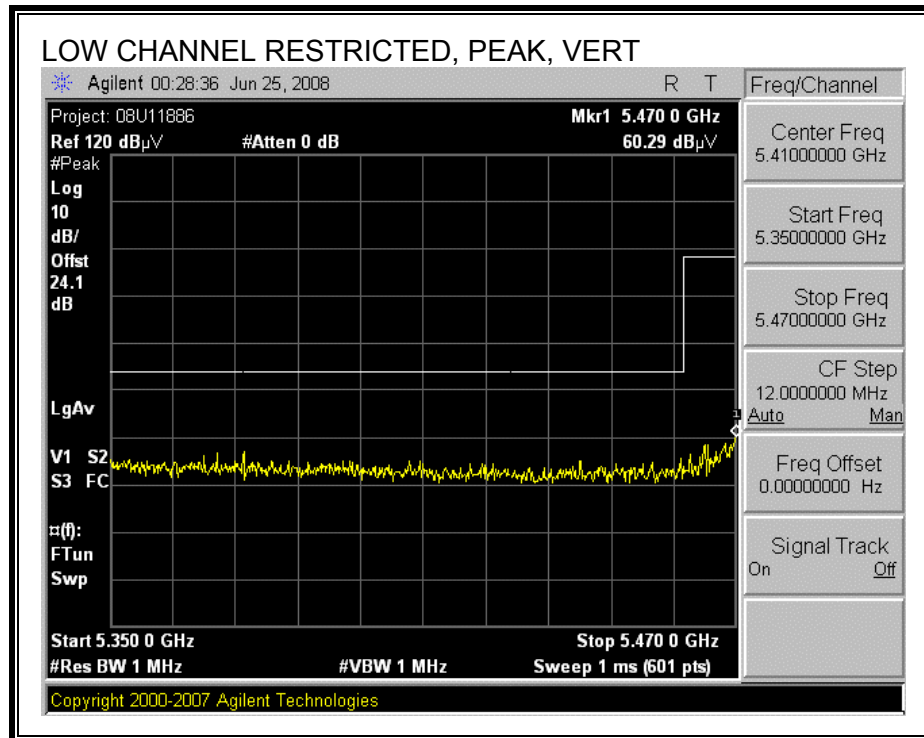


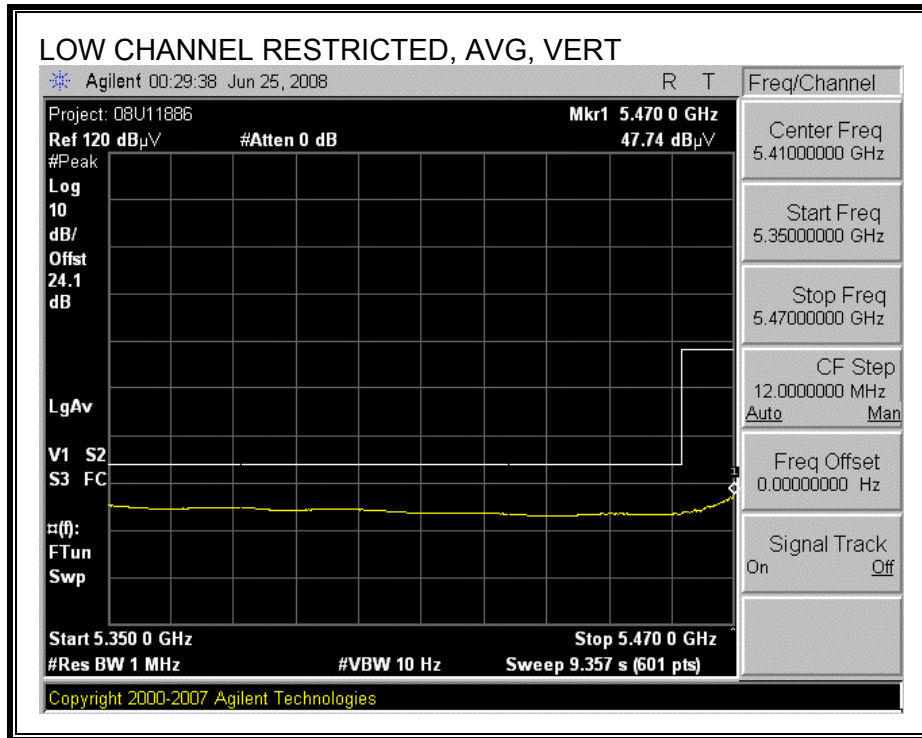
## HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement															
Compliance Certification Services, Fremont 5m Chamber															
Company: Atheros Communications, Inc.															
Project #: 08U11886															
Date: 6/26/2008															
Test Engineer: Tom Chen															
Configuration: EUT with Laptop															
Mode: a Mode, Tx On (Polarization worst case: Vertical)															
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T60; S/N: 2238 @3m		T145 Agilent 3008A005						FCC 15.205							
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					
				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	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 5500 MHz															
11.000	3.0	40.2	20.6	37.3	0.0	-33.8	0.0	0.0	43.8	24.2	74	54	-30.2	-29.8	H
11.000	3.0	45.3	26.0	37.3	0.0	-33.8	0.0	0.0	48.9	29.6	74	54	-25.1	-24.4	V
Mid Ch. 5600 MHz															
11.200	3.0	41.0	21.5	37.3	0.0	-33.5	0.0	0.0	44.9	25.4	74	54	-29.1	-28.6	V
High Ch. 5700 MHz															
11.400	3.0	41.5	21.4	37.4	0.0	-33.2	0.0	0.0	45.6	25.5	74	54	-28.4	-28.5	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								

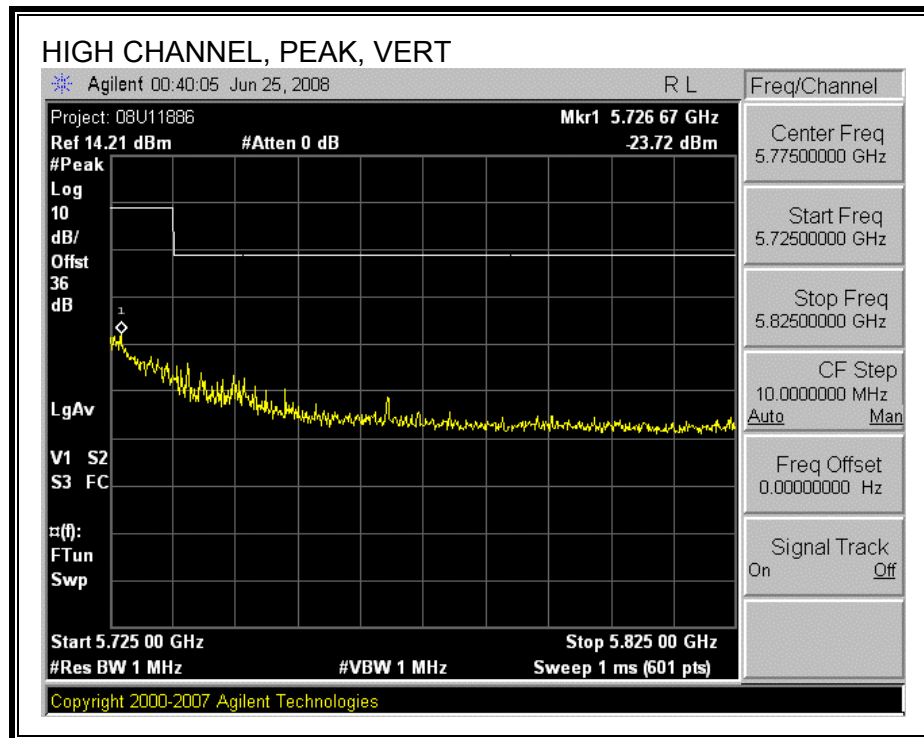
## 8.2.7. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 5.6 GHz BAND

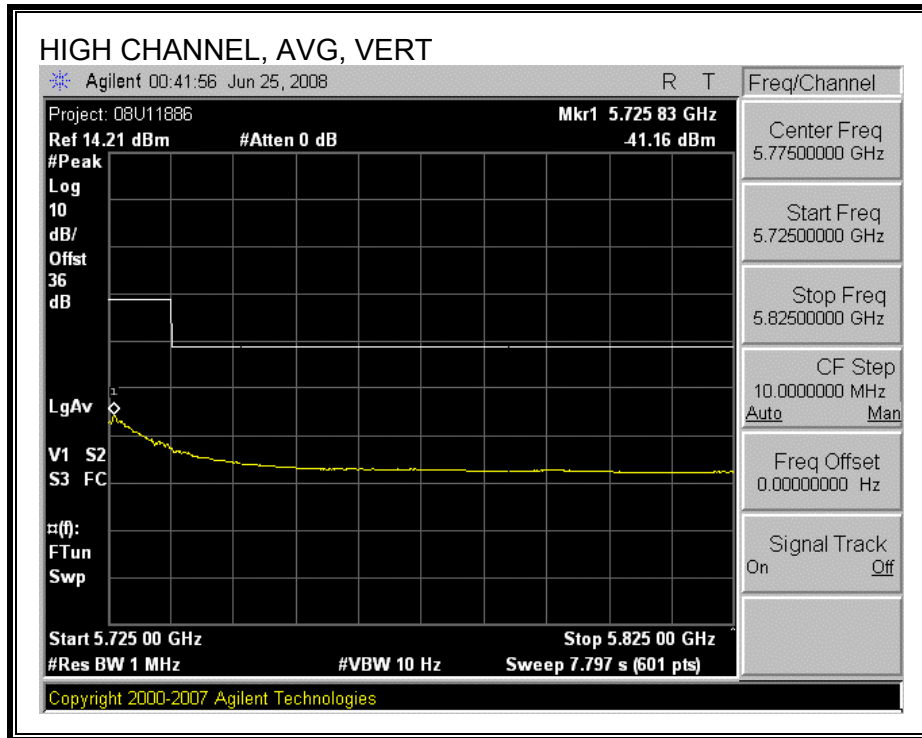
### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





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



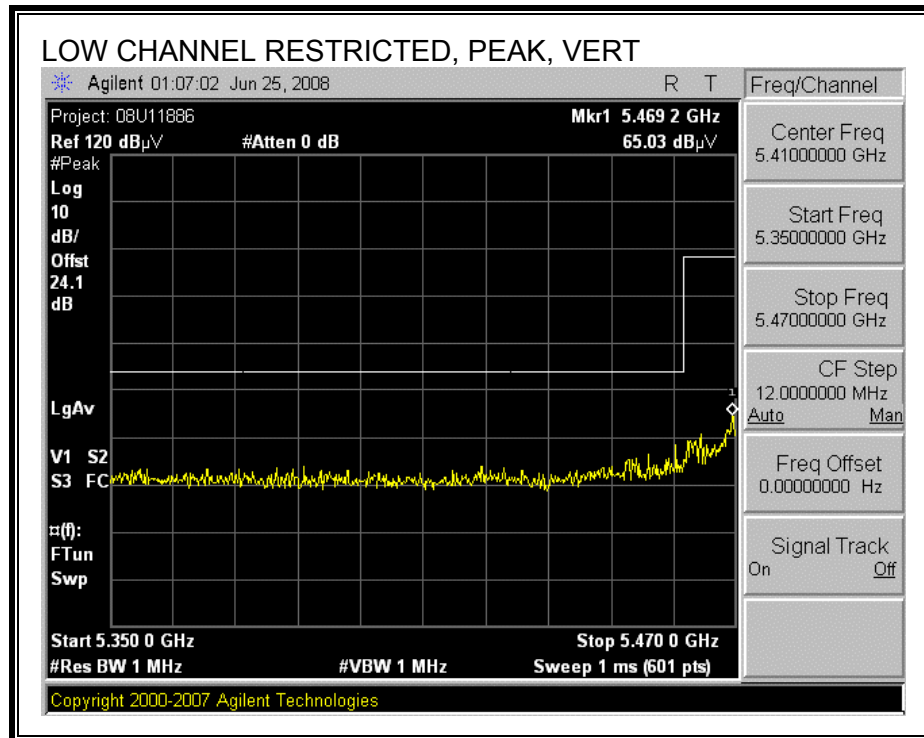


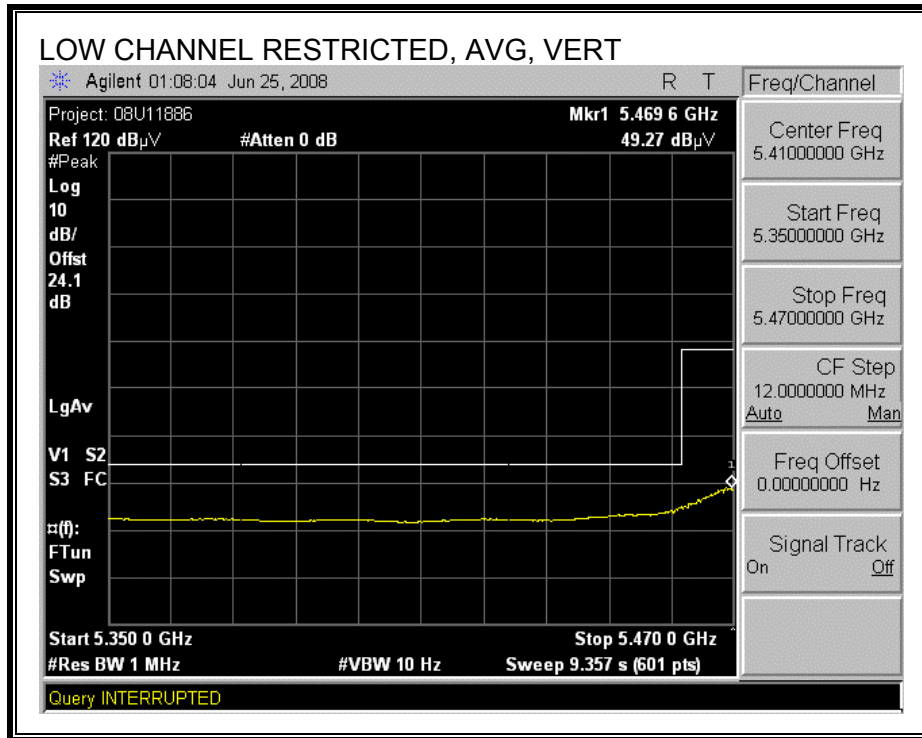


High Frequency Measurement															
Compliance Certification Services, Fremont 5m Chamber															
Company: Atheros Communications, Inc.															
Project #: 08U11886															
Date: 6/26/2008															
Test Engineer: Tom Chen															
Configuration: EUT with Laptop															
Mode: HT20 Mode, Tx On (Polarization worst case: Vertical)															
<b>Test Equipment:</b>															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz				Limit					
T60; S/N: 2238 @3m		T145 Agilent 3008A005								FCC 15.205					
Hi Frequency Cables															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz ; VEW=10Hz					
				C-5m Chamber				R_001							
f	Dist	Read Pk	Read Avg.	AF	CL	Amp	D Corr	Fldr	Peak	Avg	Pk Lim	Avg Lim	Pk Mar	Avg Mar	Notes
GHz	(m)	dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)
<b>Low Ch. 5500 MHz</b>															
11.000	3.0	40.3	21.0	37.3	0.0	-33.8	0.0	0.0	43.9	24.6	74	54	-30.1	-29.4	H
11.000	3.0	41.8	22.0	37.3	0.0	-33.8	0.0	0.0	45.4	25.6	74	54	-28.6	-28.4	V
<b>Mid Ch. 5600 MHz</b>															
11.200	3.0	45.0	26.0	37.3	0.0	-33.5	0.0	0.0	48.9	29.9	74	54	-25.1	-24.1	V
<b>High Ch. 5700 MHz</b>															
11.400	3.0	41.0	21.0	37.4	0.0	-33.2	0.0	0.0	45.1	25.1	74	54	-28.9	-28.9	V
															V
Rev. 4.12.7															
<b>Note: No other emissions were detected above the system noise floor</b>															
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								

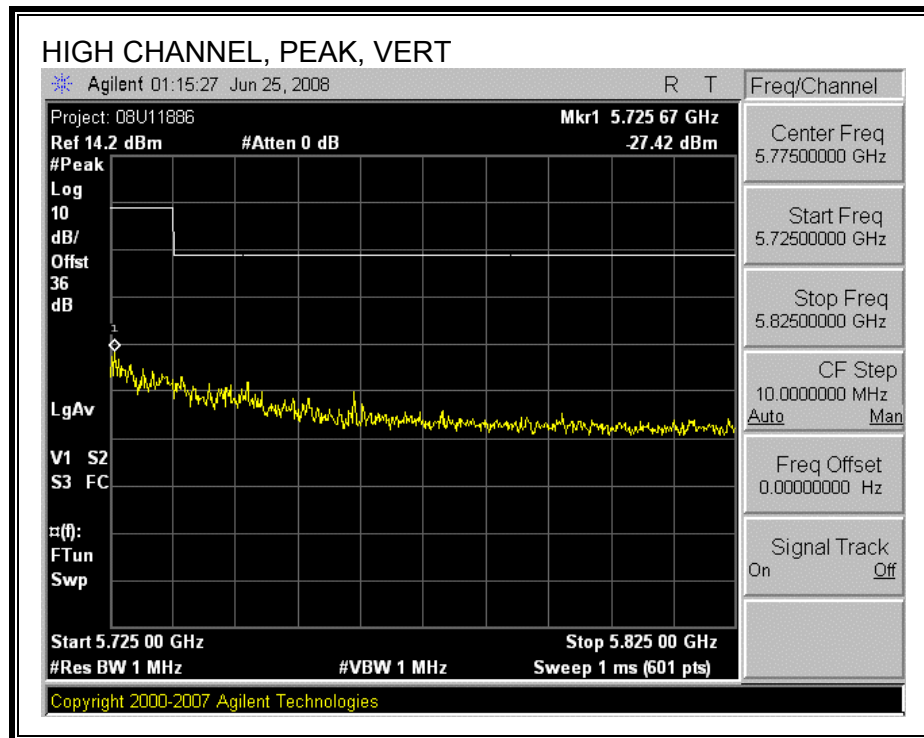
## 8.2.8. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE 5.6 GHz BAND

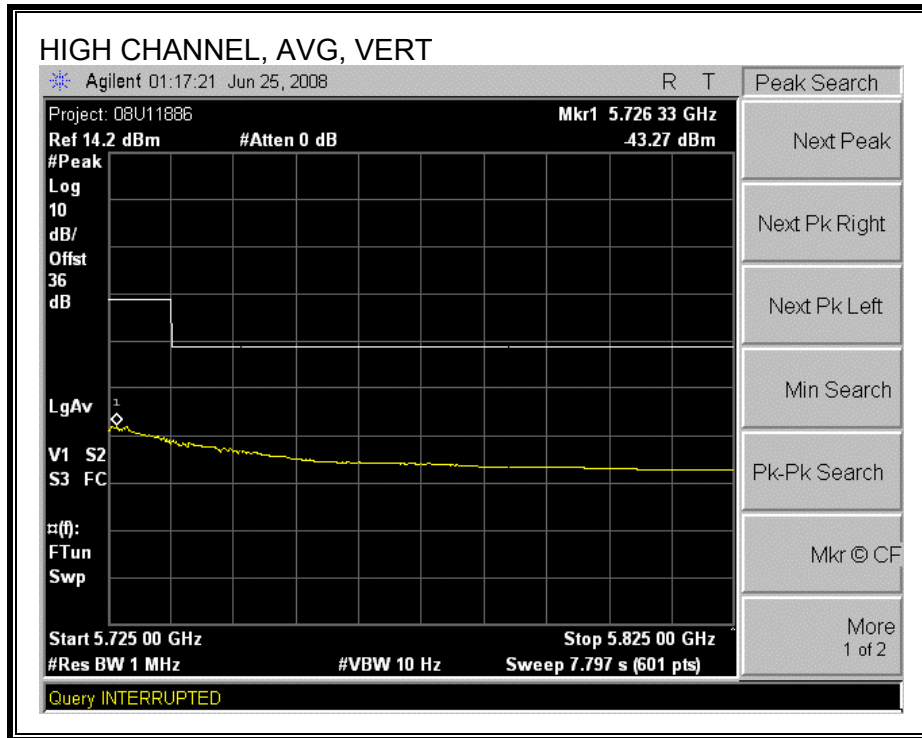
### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





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





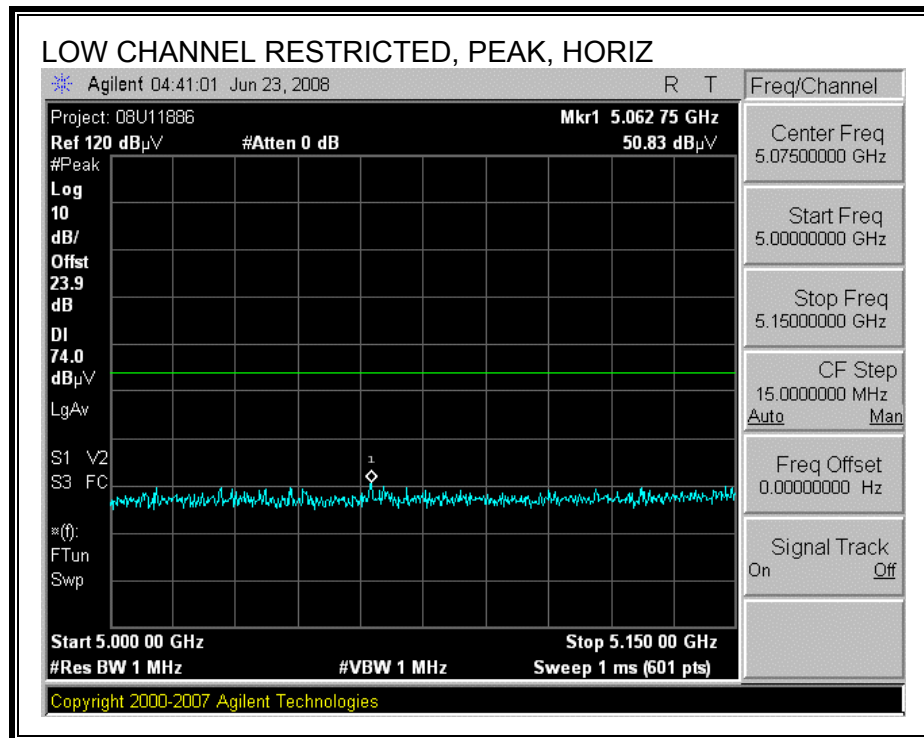
## HARMONICS AND SPURIOUS EMISSIONS

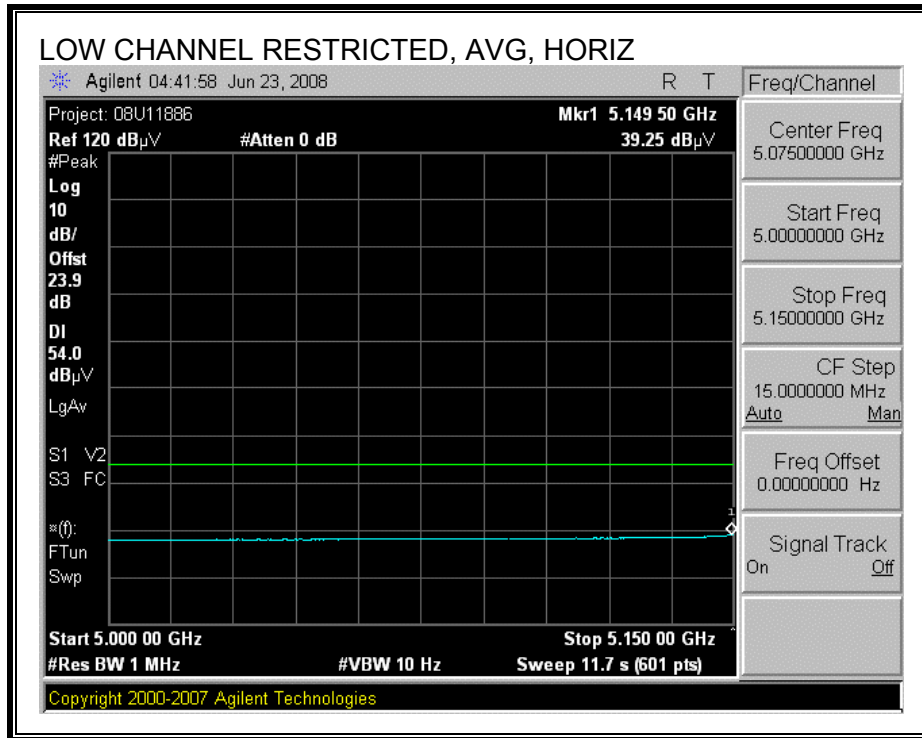
High Frequency Measurement															
Compliance Certification Services, Fremont 5m Chamber															
Company: Atheros Communications, Inc.															
Project #: 08U11886															
Date: 6/26/2008															
Test Engineer: Tom Chen															
Configuration: EUT with Laptop															
Mode: HT40 Mode, Tx On (Polarization worst case: Vertical)															
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T60; S/N: 2238 @3m		T145 Agilent 3008A005						FCC 15.205							
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					
				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	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 5510 MHz															
11.200	3.0	40.3	20.1	37.3	0.0	-33.5	0.0	0.0	44.2	24.0	74	54	-29.8	-30.0	H
11.200	3.0	41.3	21.2	37.3	0.0	-33.5	0.0	0.0	45.2	25.1	74	54	-28.8	-28.9	V
Mid Ch. 5590 MHz															
11.180	3.0	43.3	25.0	37.3	0.0	-33.5	0.0	0.0	47.1	28.8	74	54	-26.9	-25.2	V
High Ch. 5670 MHz															
11.340	3.0	40.2	20.4	37.4	0.0	-33.3	0.0	0.0	44.3	24.5	74	54	-29.7	-29.5	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. TRANSMITTER ABOVE 1 GHz (FEM #2)

#### 8.3.1. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE LOWER 5.2 GHz BAND

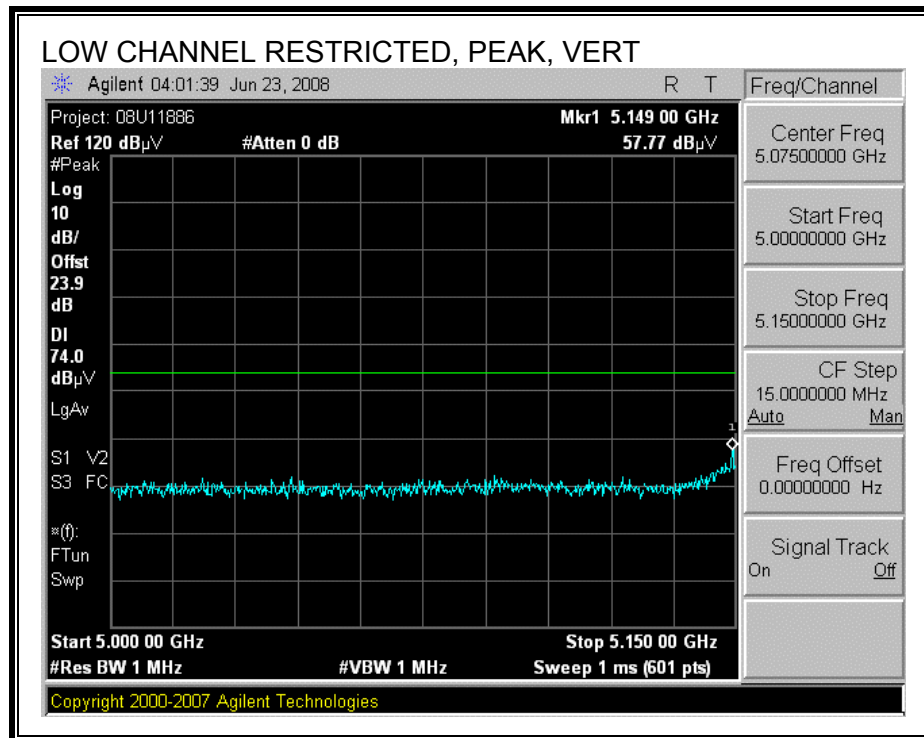
##### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

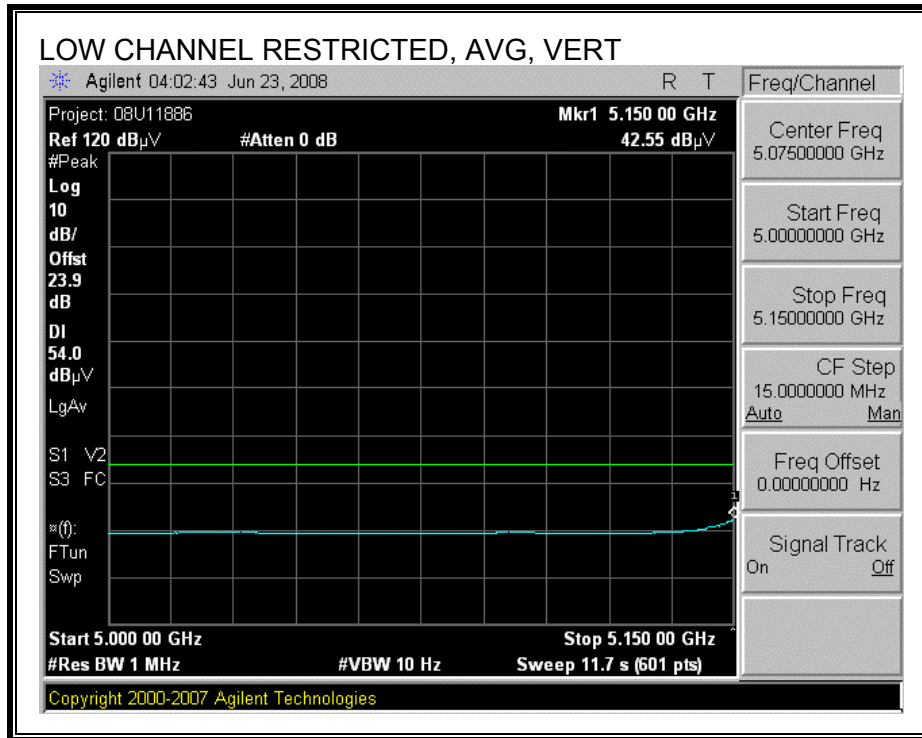




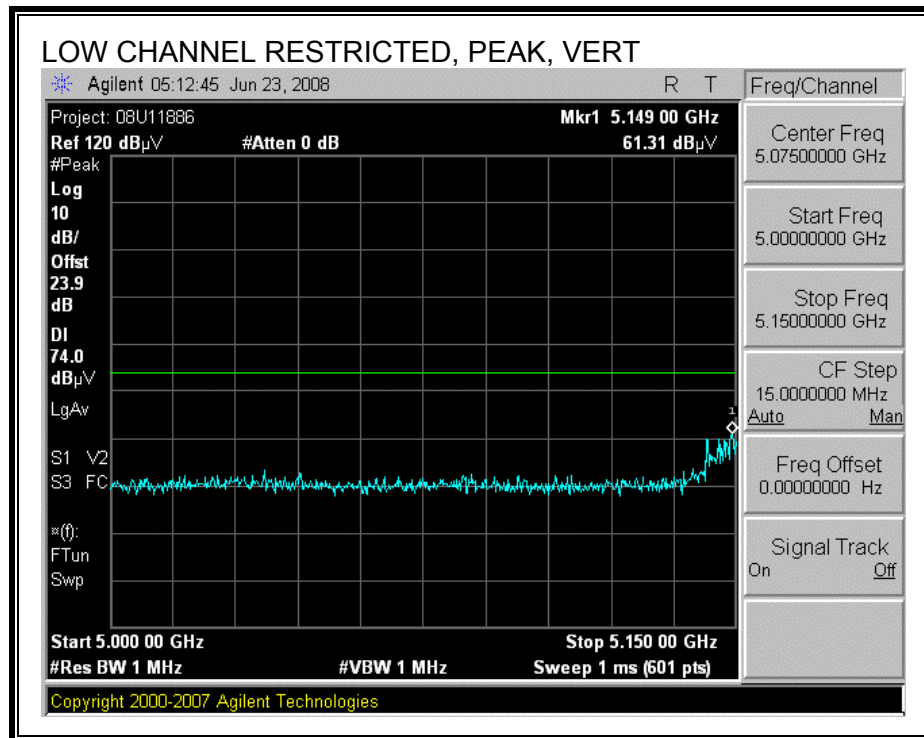


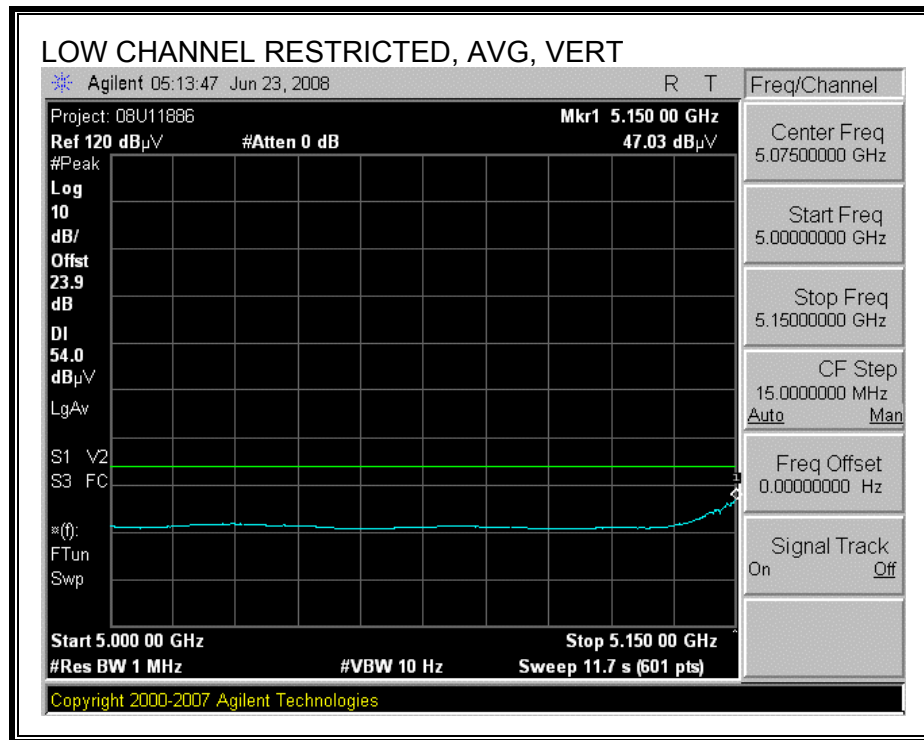
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**





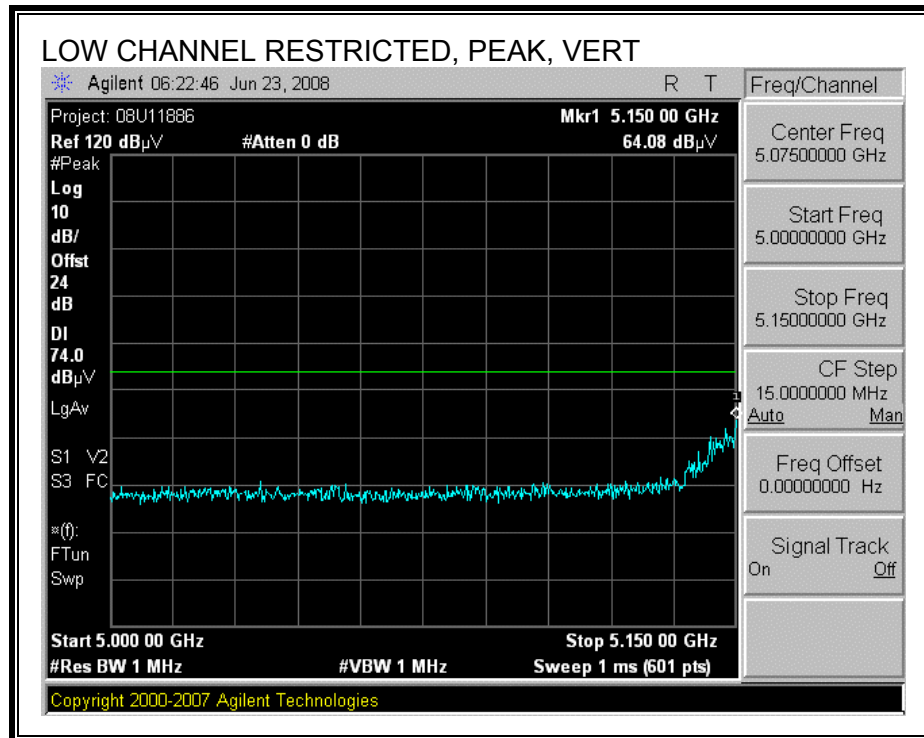
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

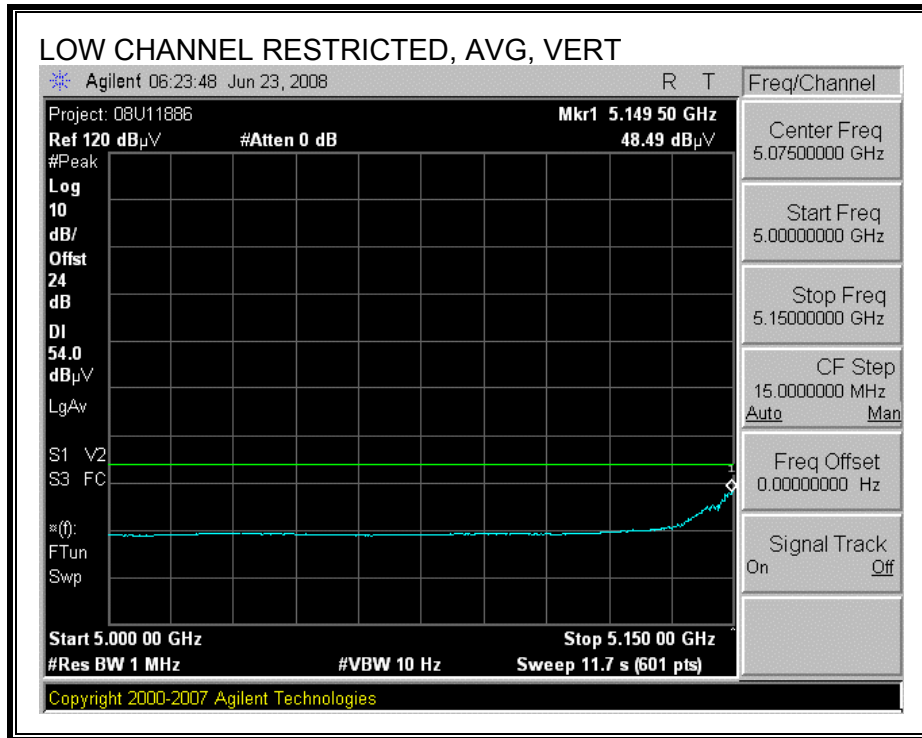




### 8.3.2. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE LOWER 5.2 GHz BAND

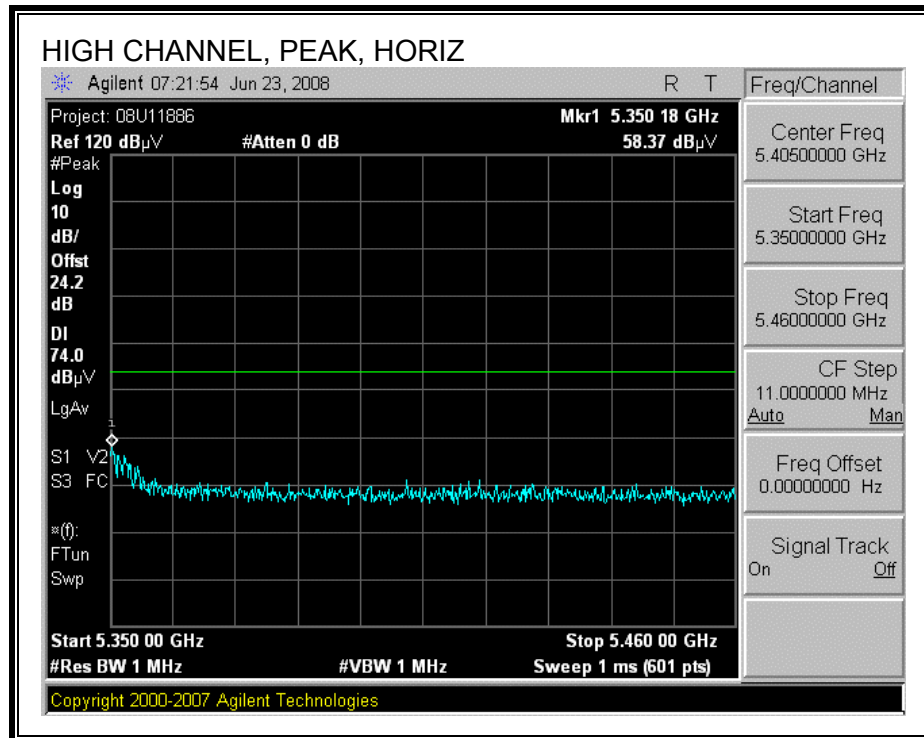
#### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

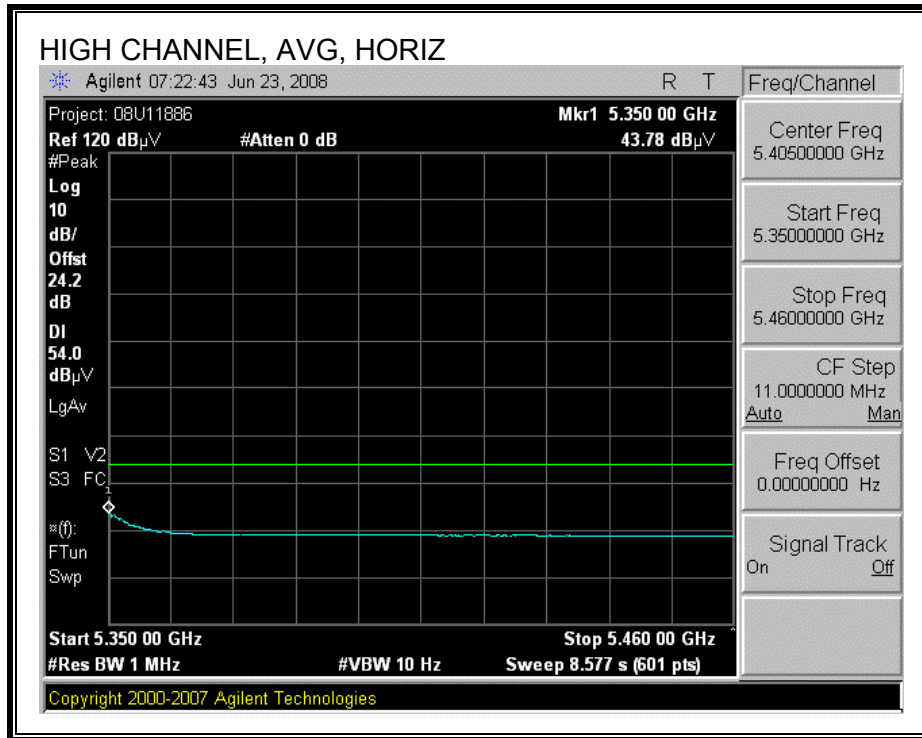




### 8.3.3. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE UPPER 5.2 GHz BAND

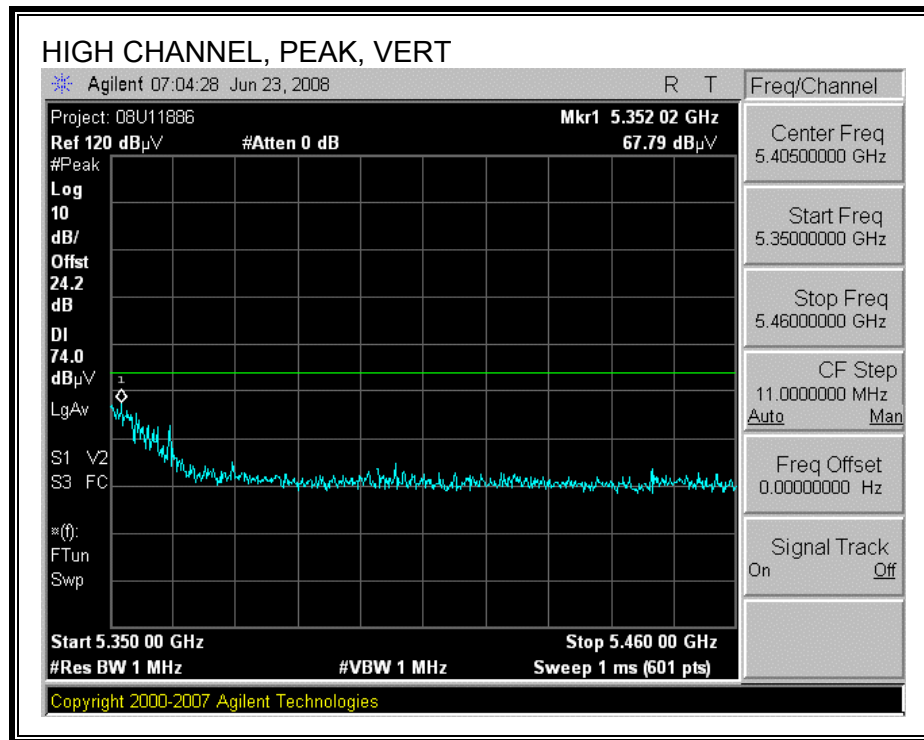
#### AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

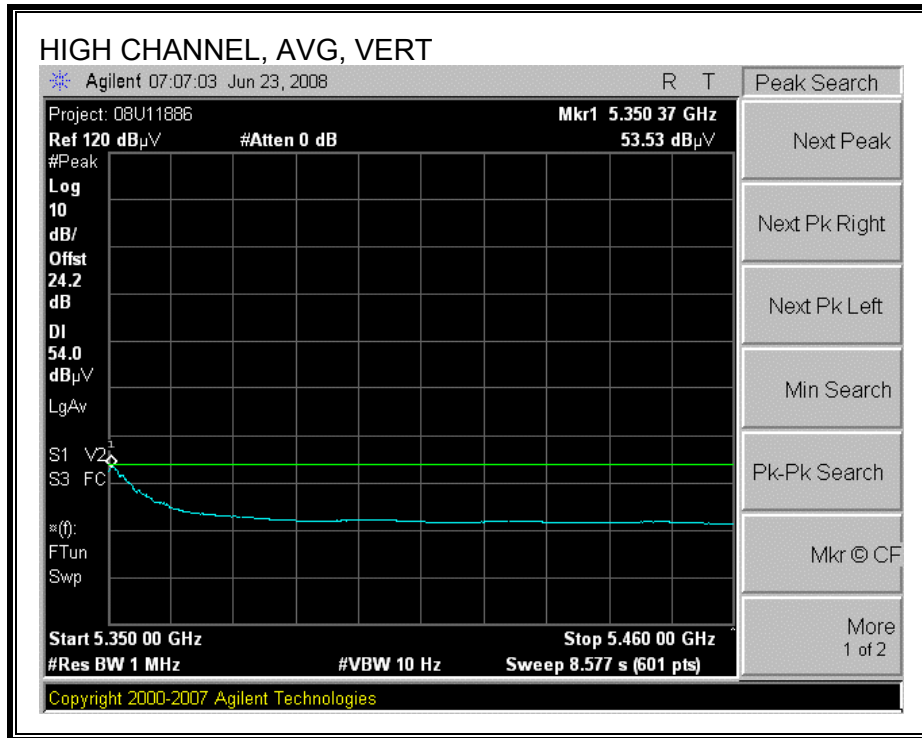






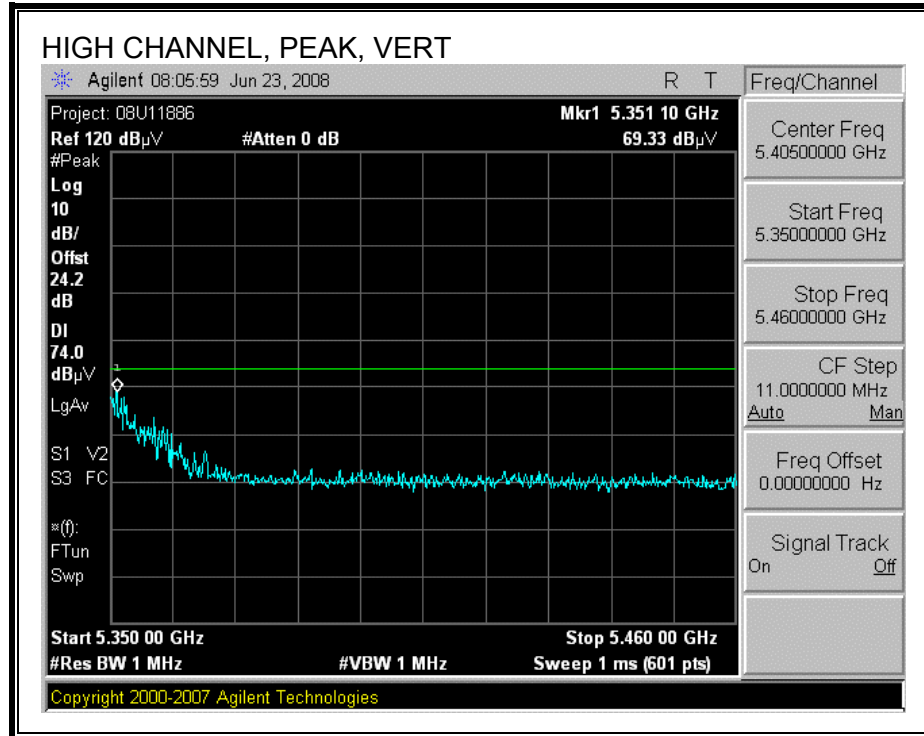
**AUTHORIZED BANDEDGE (LOW CHANNEL, VERTICAL)**

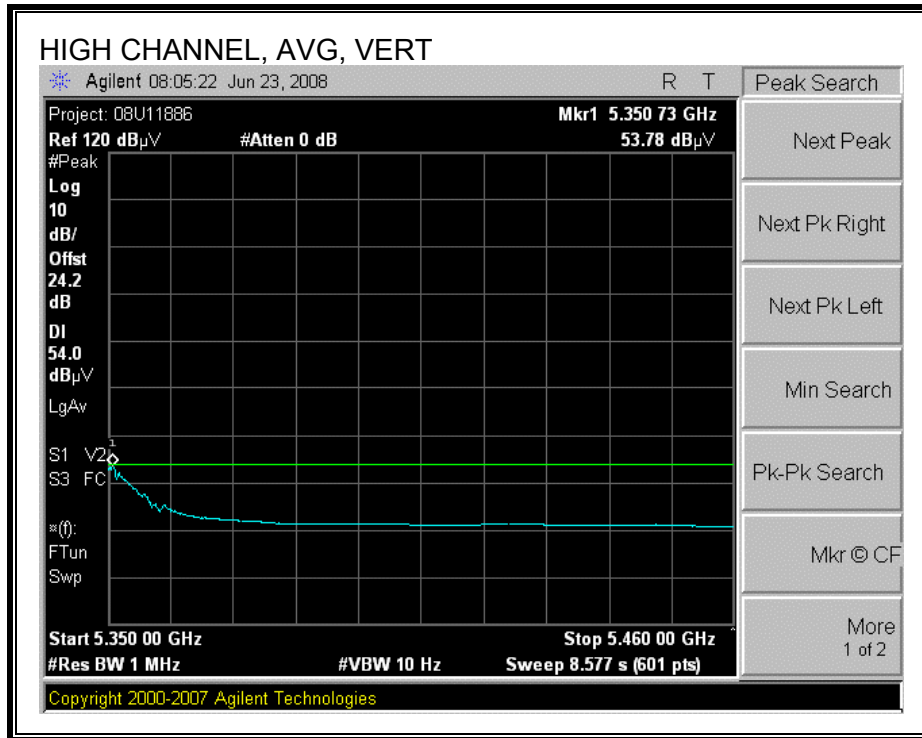




### 8.3.4. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE UPPER 5.2 GHz BAND

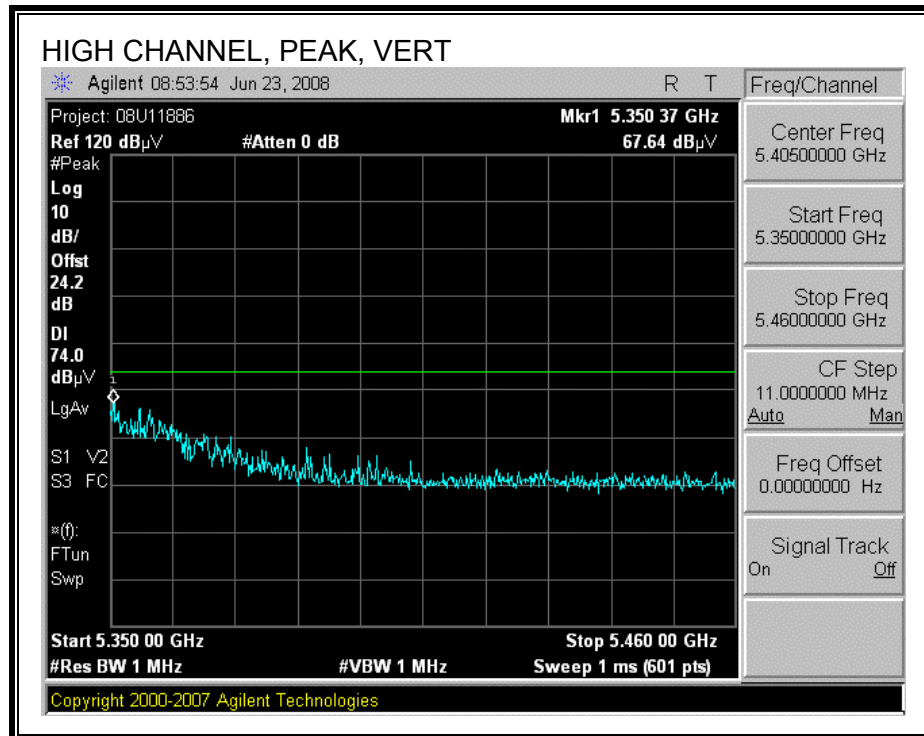
#### AUTHORIZED BANDEDGE (LOW CHANNEL, VERTICAL)

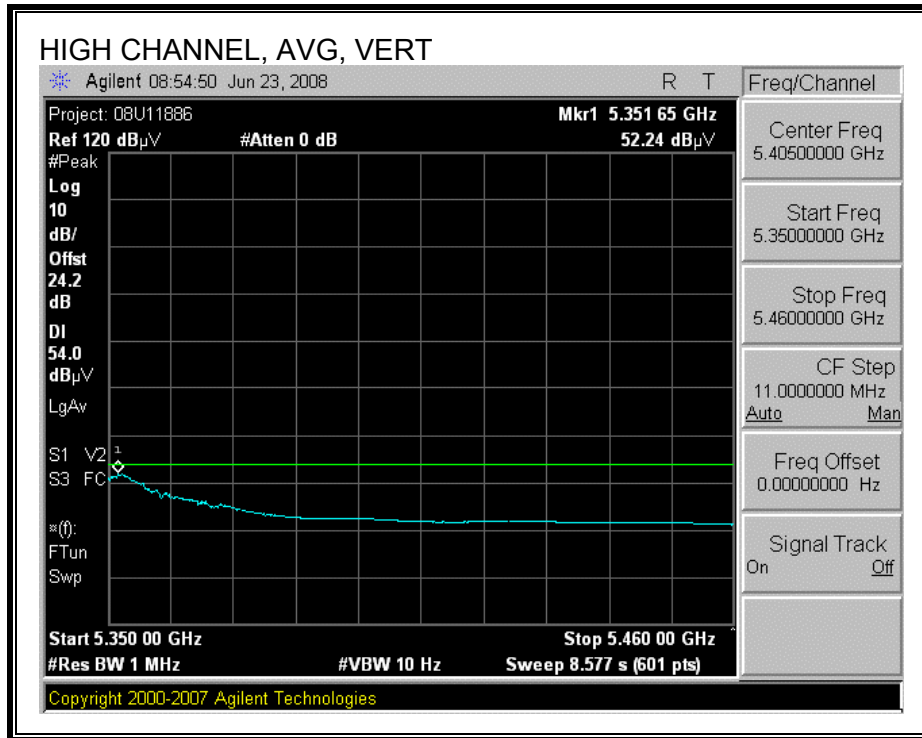




### 8.3.5. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE UPPER 5.2 GHz BAND

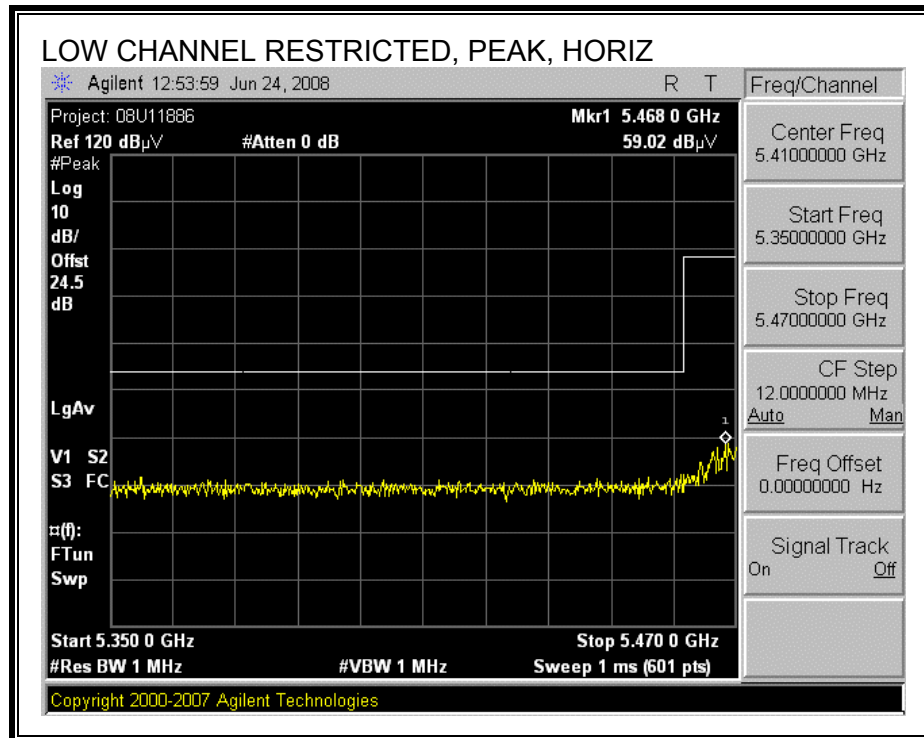
#### AUTHORIZED BANDEDGE (LOW CHANNEL, VERTICAL)

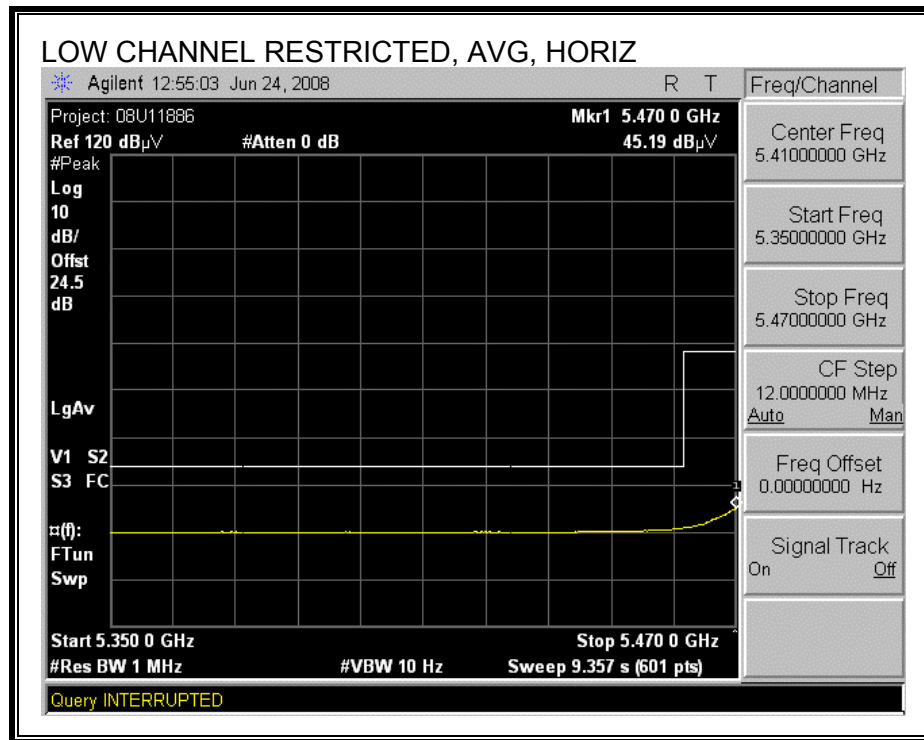




### 8.3.6. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE 5.6 GHz BAND

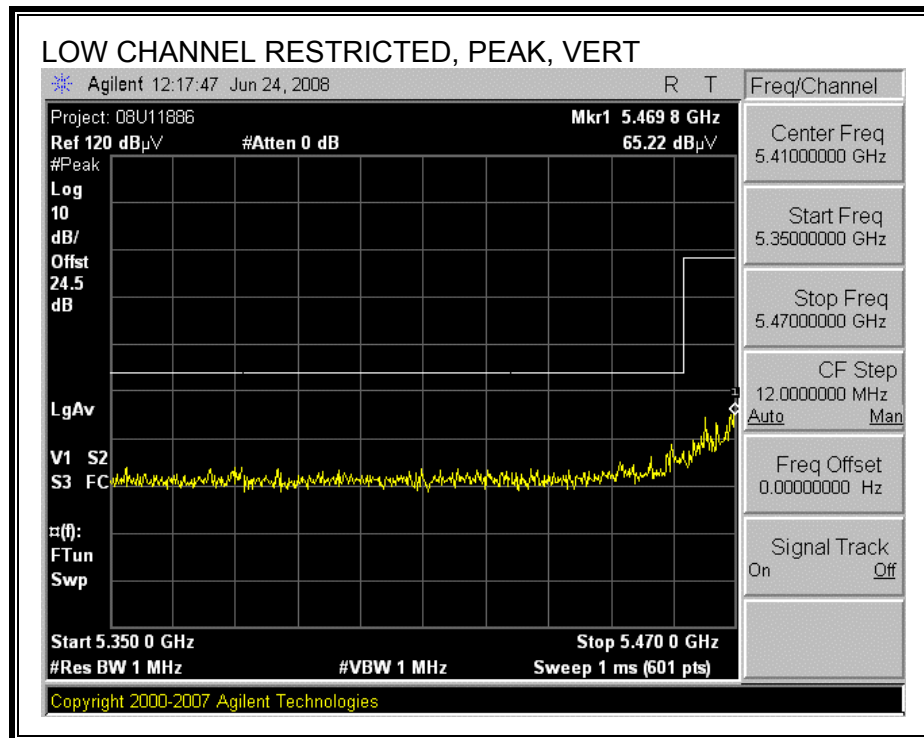
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

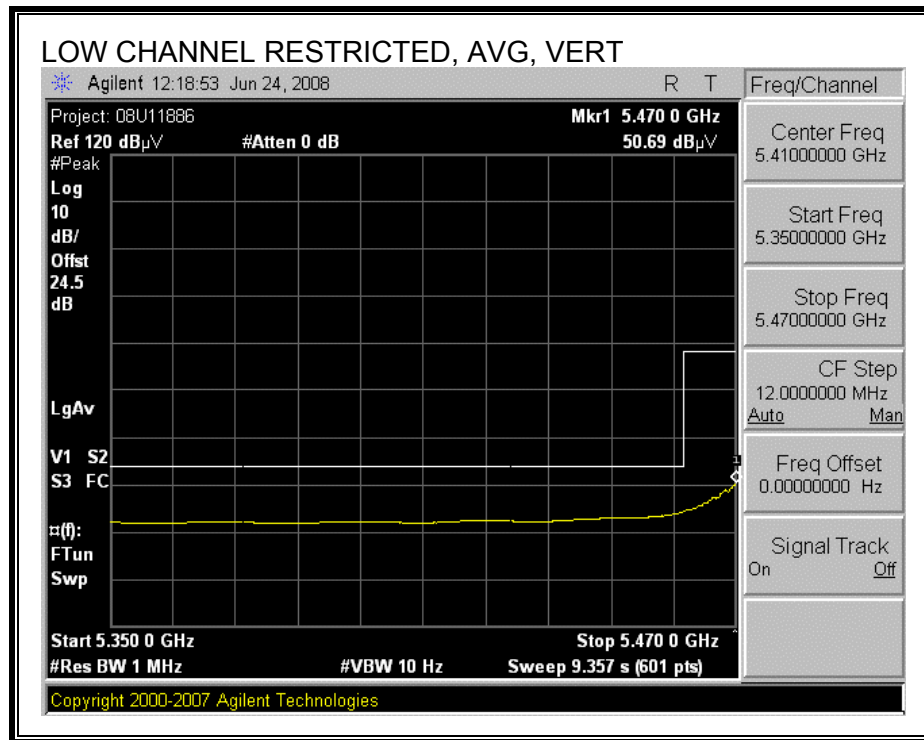




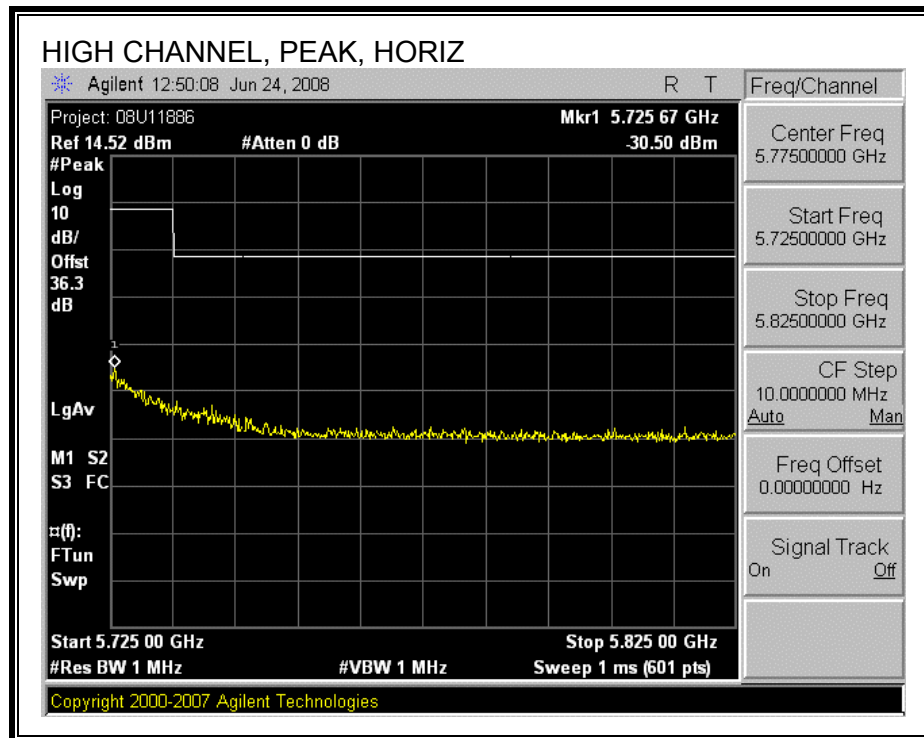


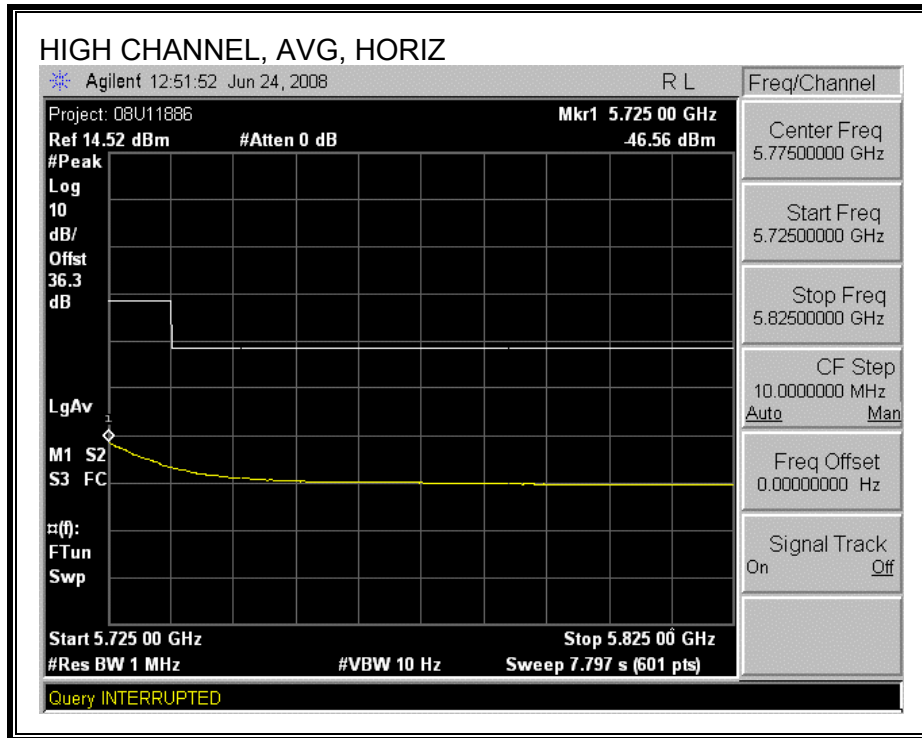
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**



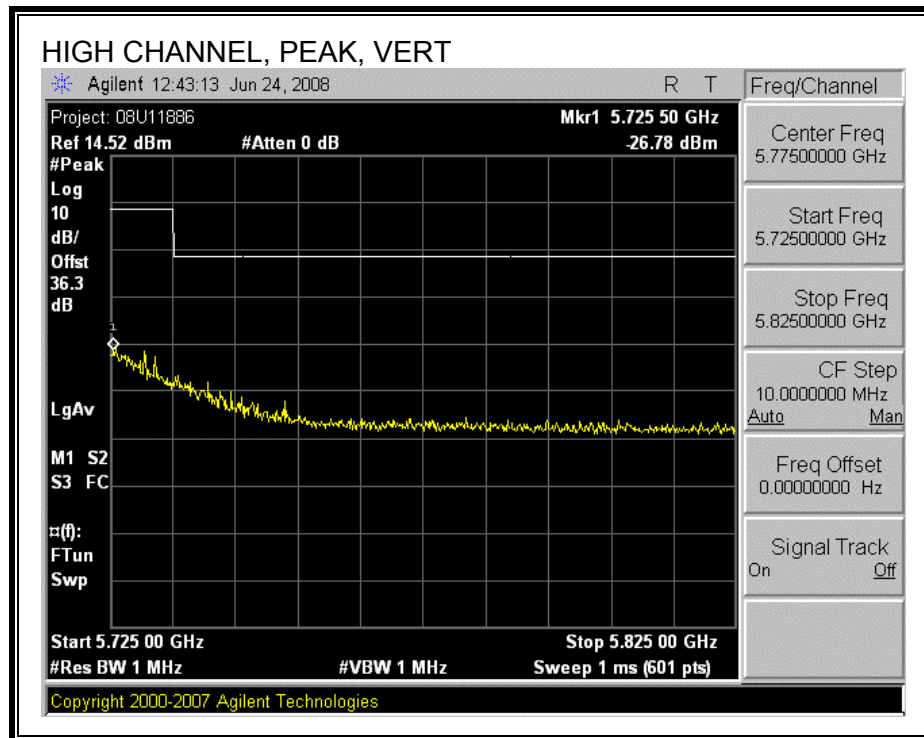


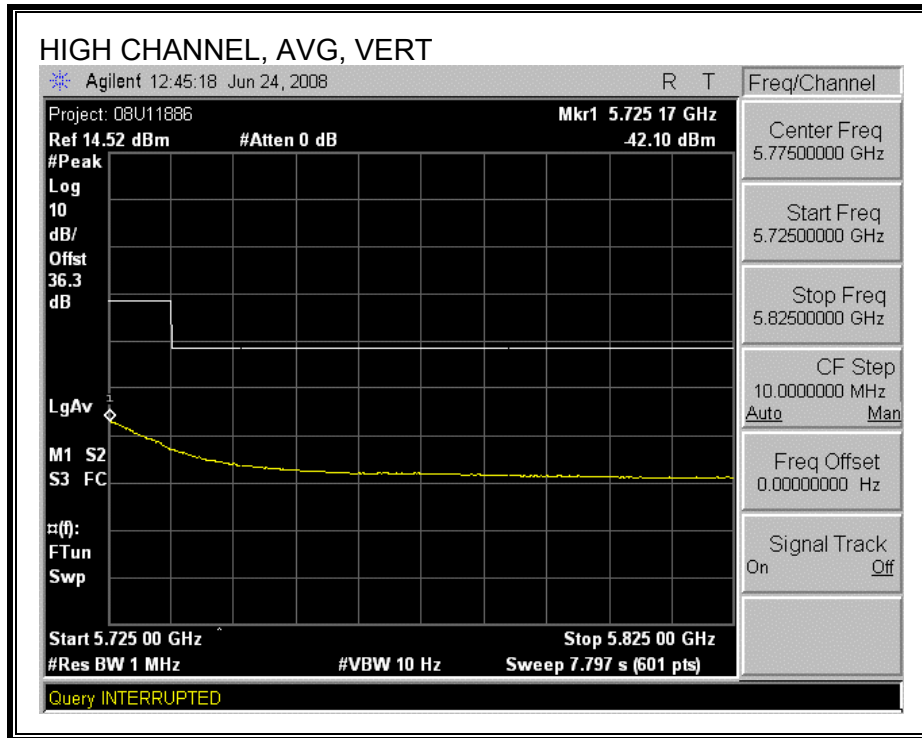
**AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





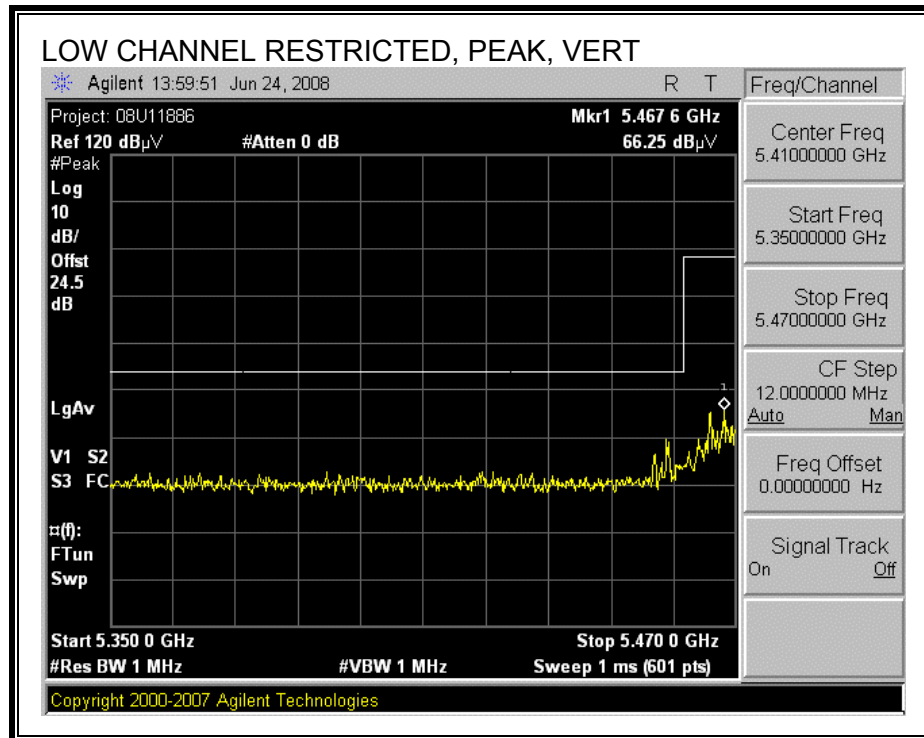
**AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)**

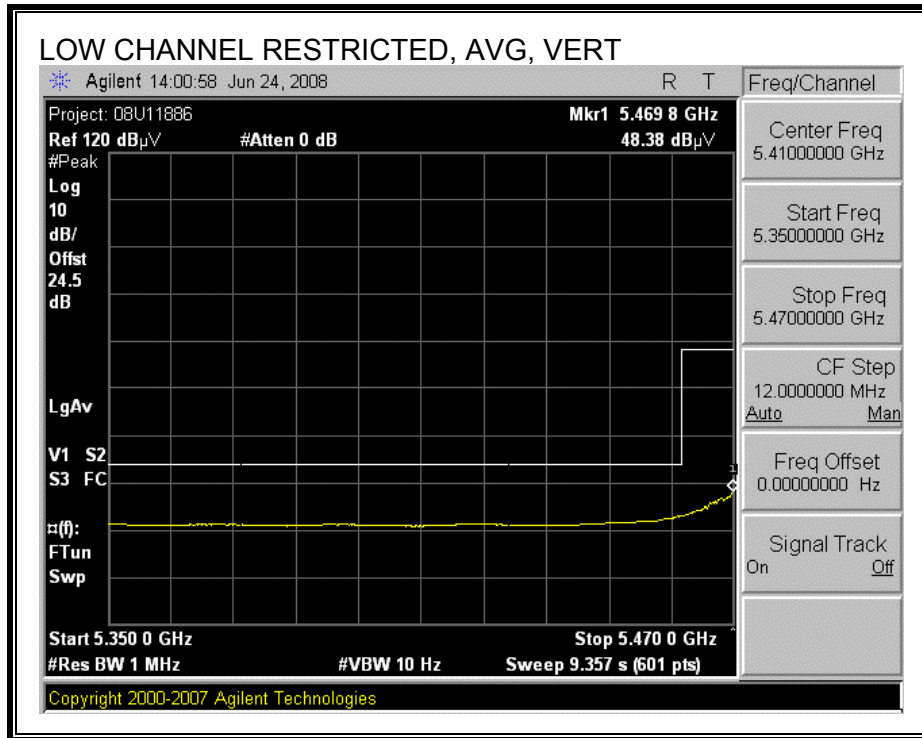




### 8.3.7. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 5.6 GHz BAND

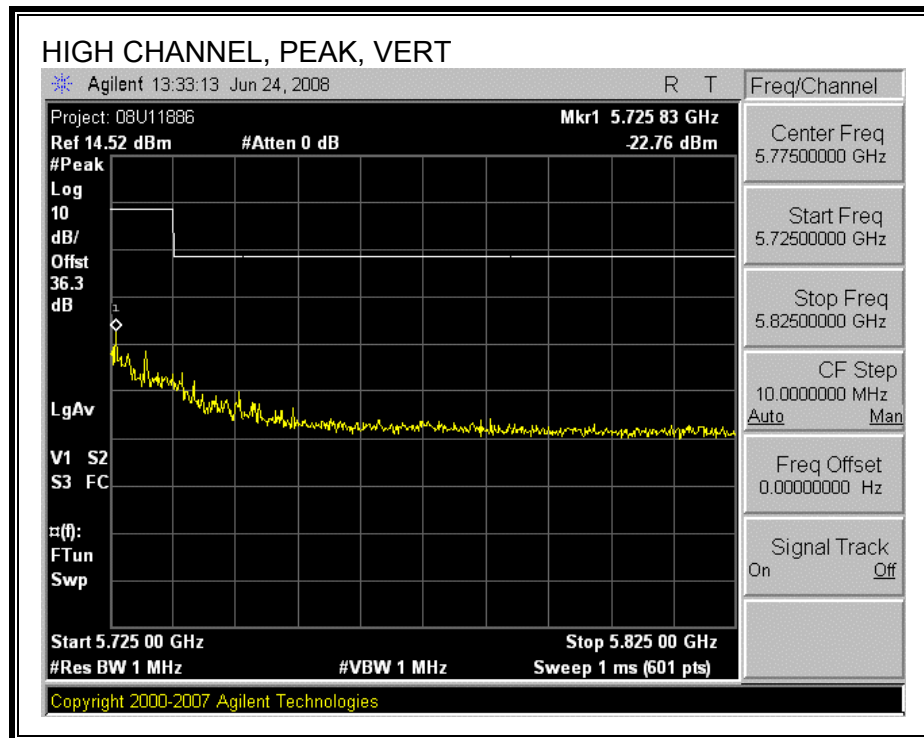
#### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

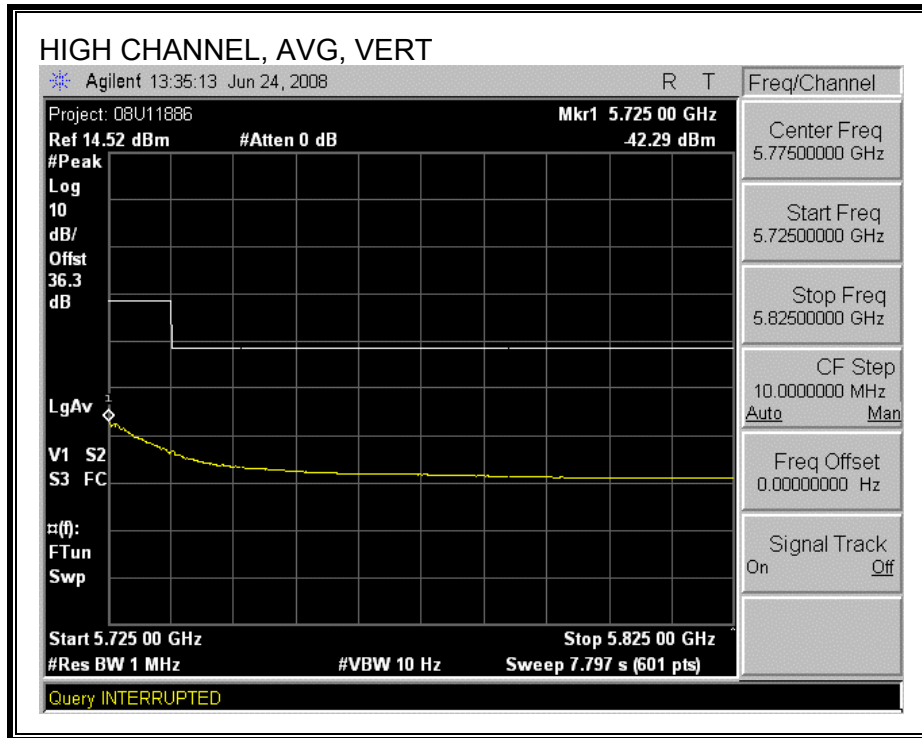






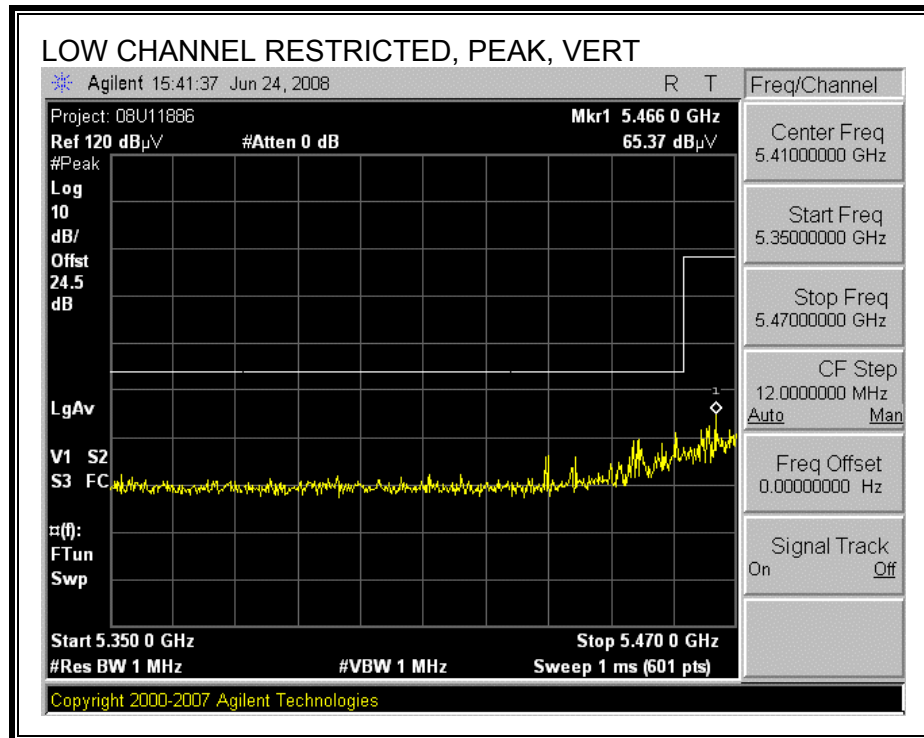
**AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)**

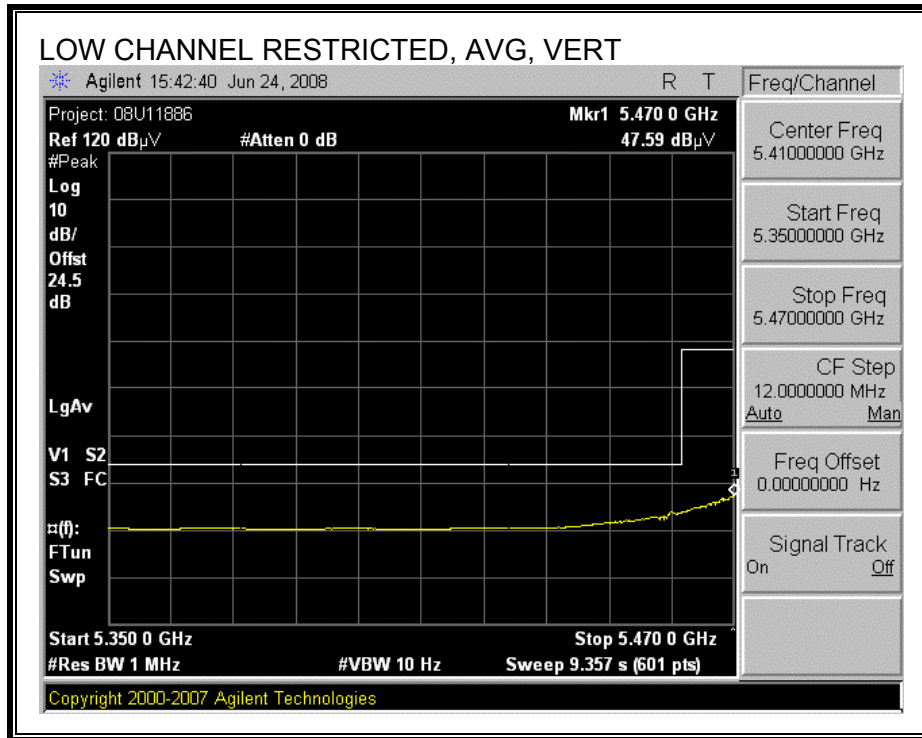




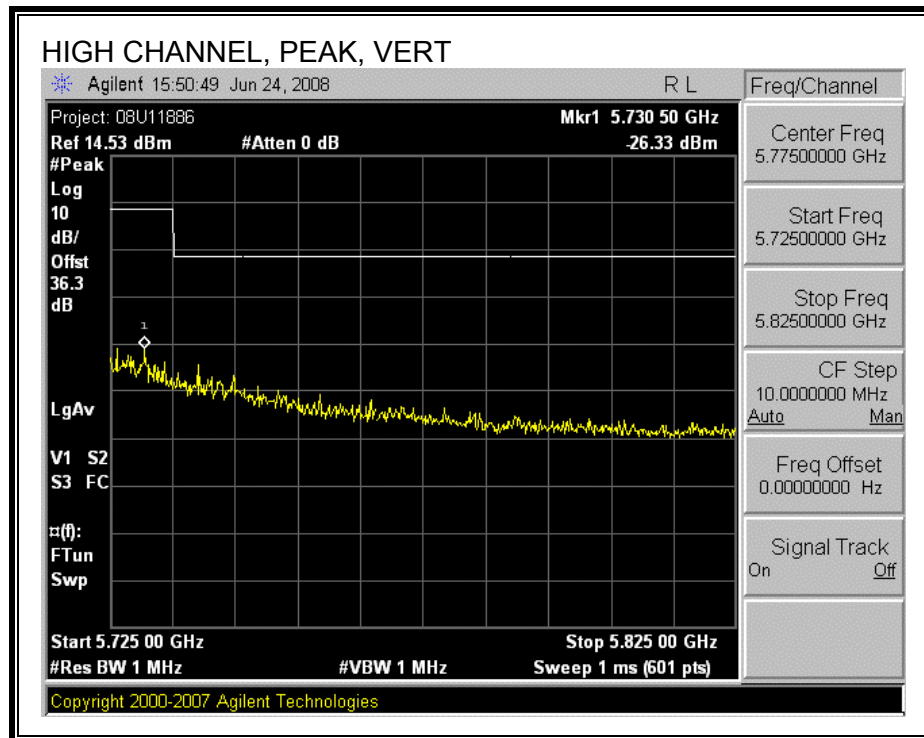
### 8.3.8. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE 5.6 GHz BAND

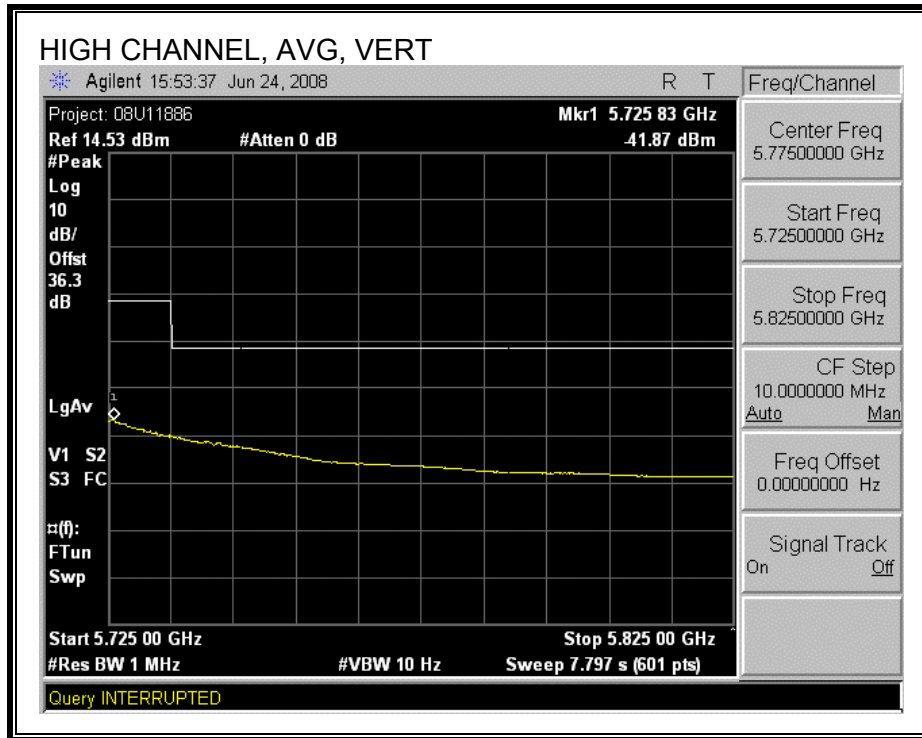
#### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





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





## 8.4. RECEIVER ABOVE 1 GHz WORST CASE

<b>High Frequency Measurement</b> Compliance Certification Services, Fremont 5m Chamber  Company: Atheros Communications, Inc. Project #: 08U11886 Date: 6/25/2008 Test Engineer: Tom Chen Configuration: EUT with Laptop Mode: Rx, 5 GHz Band ( Worst Case )															
<b>Test Equipment:</b>															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T60; S/N: 2238 @3m		T145 Agilent 3008A005C						RX RSS 210							
<b>Hi Frequency Cables</b>															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		<b>Peak Measurements</b> RBW=VBW=1MHz <b>Average Measurements</b> RBW=1MHz ; VBW=10Hz					
				C-5m Chamber											
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)
Mid Ch. 5300 MHz															
1.200	3.0	50.5	30.1	25.9	0.0	-36.0	0.0	0.0	40.4	20.0	74	54	-33.6	-34.0	H
1.480	3.0	52.7	32.3	26.6	0.0	-35.8	0.0	0.0	43.5	23.1	74	54	-30.5	-30.9	H
1.490	3.0	54.2	34.2	26.7	0.0	-35.8	0.0	0.0	45.0	25.1	74	54	-29.0	-28.9	V
2.490	3.0	55.4	35.6	28.8	0.0	-35.1	0.0	0.0	49.2	29.3	74	54	-24.8	-24.7	V
Rev. 4.12.7 <b>Note: No other emissions were detected above the system noise floor.</b>															
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											

## 8.5. WORST-CASE BELOW 1 GHz

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

#### HORIZONTAL DATA

Condition: FCC CLASS-B HORIZONTAL  
Test Operator:: Chin Pang  
Project #: : 08U11886  
Company: : Atheros  
Configuration:: EUT/Antenna/Laptop  
Mode : : TX ( Worst Case)  
Target: : FCC Class B

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	58.130	49.13	-19.63	29.51	40.00	-10.50	Peak
2	261.830	49.42	-13.66	35.76	46.00	-10.24	Peak
3	358.830	46.74	-11.00	35.74	46.00	-10.26	Peak
4	424.790	43.19	-9.22	33.97	46.00	-12.03	Peak
5	455.830	47.46	-8.53	38.93	46.00	-7.07	Peak
6	552.830	41.77	-6.32	35.45	46.00	-10.55	Peak



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

**VERTICAL DATA**

Condition: FCC CLASS-B VERTICAL  
Test Operator:: Chin Pang  
Project #: : 08U11886  
Company: : Atheros  
Configuration:: EUT/Antenna/Laptop  
Mode : : TX ( Worst Case)  
Target: : FCC Class B

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	58.130	53.51	-19.63	33.89	40.00	-6.12	Peak
2	158.040	44.86	-14.11	30.75	43.50	-12.75	Peak
3	358.830	43.07	-11.00	32.07	46.00	-13.93	Peak
4	421.880	41.17	-9.34	31.83	46.00	-14.17	Peak
5	487.840	39.23	-7.49	31.74	46.00	-14.26	Peak
6	552.830	40.50	-6.32	34.18	46.00	-11.82	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

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

### RESULTS

# **6 WORST EMISSIONS**

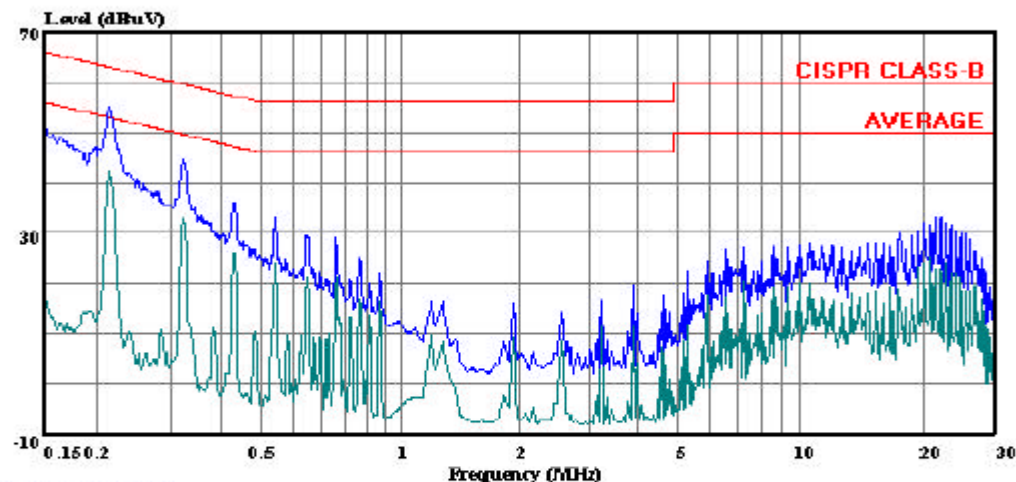
CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.21	55.17	--	40.85	0.00	63.05	53.05	-7.88	-12.20	L1
0.32	44.60	--	32.75	0.00	59.63	49.63	-15.03	-16.88	L1
22.16	33.38	--	25.18	0.00	60.00	50.00	-26.62	-24.82	L1
0.22	55.27	--	41.00	0.00	63.01	53.01	-7.74	-12.01	L2
0.32	43.90	--	32.26	0.00	59.63	49.63	-15.73	-17.37	L2
21.37	36.91	--	29.45	0.00	60.00	50.00	-23.09	-20.55	L2
6 Worst Data									

## LINE 1 RESULTS



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

Data#: 7 File#: 08U11886.EMI Date: 06-27-2008 Time: 11:56:18



(Line Conduction)

Trace: 5

Ref Trace:

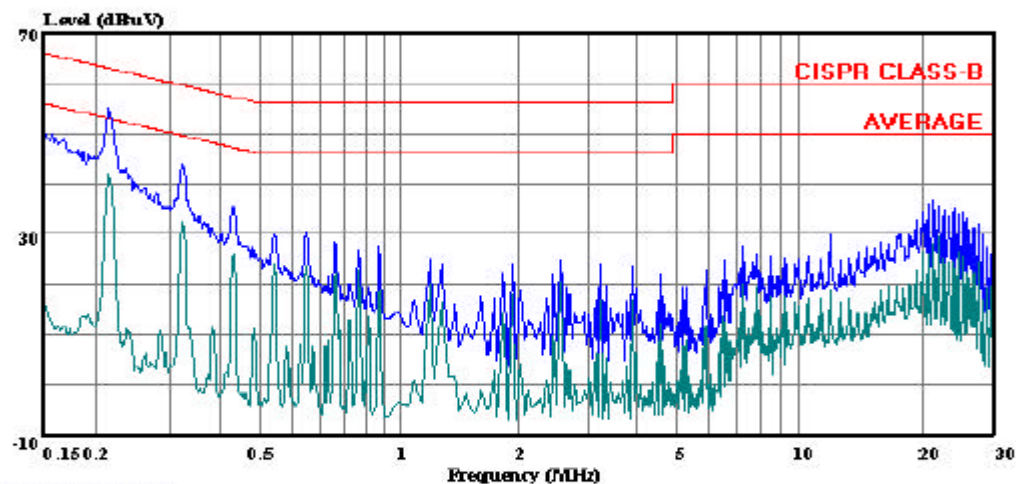
Condition: CISPR CLASS-B  
Test Operator:: Chin Pang  
Project #: : 08U11886  
Company: : Atheros  
Configuration: BUT/Antenna/Laptop  
Mode: : TX ( Worst Case )  
Target: : FCC Class B  
Voltage: : 115VAC/60Hz  
: L1: Peak (Blue); Average (Green)

## LINE 2 RESULTS



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

Data#: 14 File#: 08U11886.EMI Date: 06-27-2008 Time: 12:01:41



(Line Conduction)

Trace: 12

Ref Trace:

Condition: CISPR CLASS-B  
Test Operator:: Chin Pang  
Project #: 08U11886  
Company: Atheros  
Configuration: EUT/Antenna/Laptop  
Mode: TX ( Worst Case )  
Target: FCC Class B  
Voltage: 115VAC/60Hz  
L2: Peak (Blue); Average (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	$280/f$	$2.19/f$		6
10–30	28	$2.19/f$		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

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

**Notes:** 1. Frequency,  $f$ , is in MHz.  
2. A power density of 10 W/m<sup>2</sup> is equivalent to 1 mW/cm<sup>2</sup>.  
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (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  $S = 1.0 \text{ mW/cm}^2$

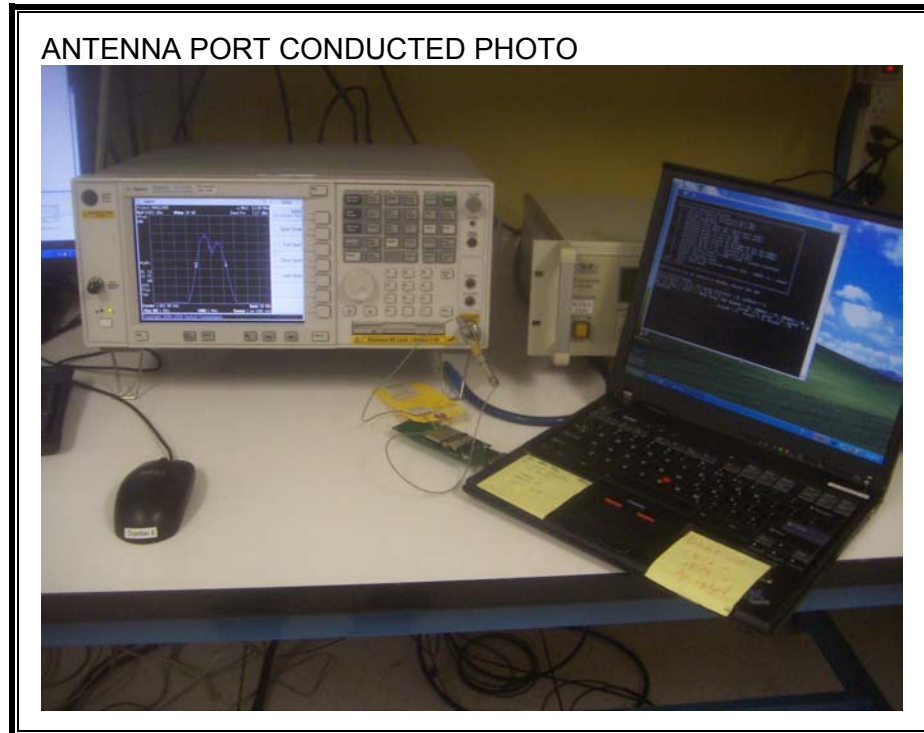
From IC Safety Code 6, Section 2.2 Table 5 Column 4,  $S = 10 \text{ W/m}^2$

## **RESULTS**

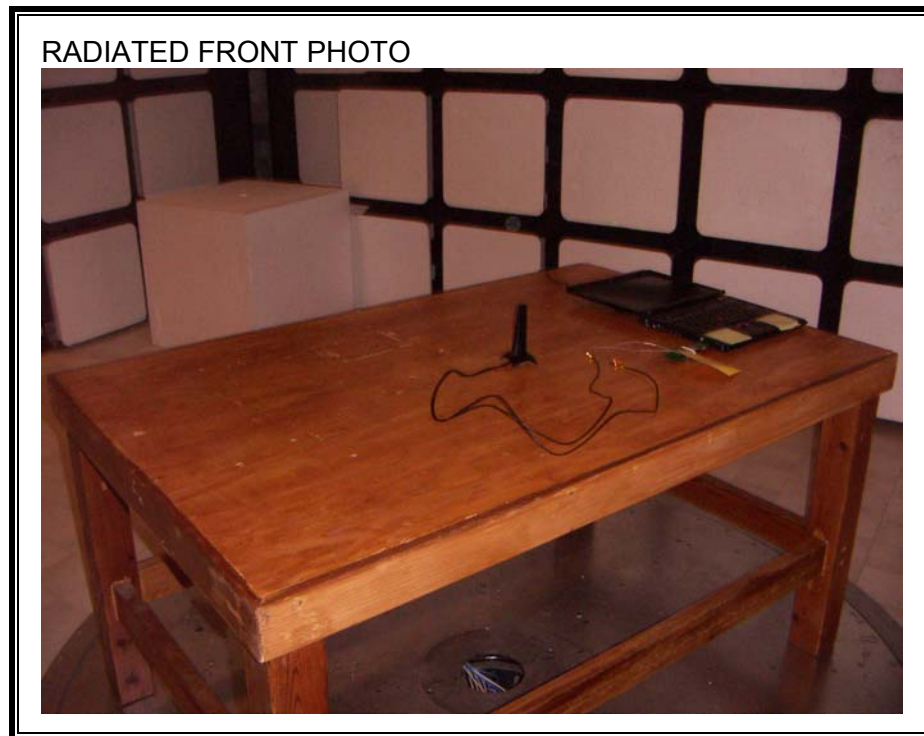
Mode	Band	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	FCC Power Density (mW/cm <sup>2</sup> )	IC Power Density (W/m <sup>2</sup> )
WLAN	5 GHz	20.0	23.87	2.39	0.08	0.84

## 11. SETUP PHOTOS

### ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



**RADIATED RF MEASUREMENT SETUP**



RADIATED BACK PHOTO



**POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP**

LINE CONDUCTED FRONT PHOTO



LINE CONDUCTED BACK PHOTO



**END OF REPORT**