

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-H FCC Model: AR5BXB92

IC ID: 4104A-ARBXB92H IC Model: AR5BXB92-H

REPORT NUMBER: 08U11886-2, Revision B

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

(R)

NVLAP LAB CODE 200065-0

Revision History

Rev.	lssue Date	Revisions	Revised By
	07/08/08	Initial Issue	T. Chan
А	07/21/08	Revised IC ID number	A. Zaffar
В	07/23/08	Updated Antenna Gain	T. Chan

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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:	nsceiver	
FCC MODEL: IC MODEL:	AR5BXB92 AR5BXB92-H	
SERIAL NUMBER:	XB92-040-S0660	
DATE TESTED:	JUNE 19-28, 2008	
	APPLICABLE STANDARDS	
ST	ANDARD	TEST RESULTS
CFR 47 F	Part 15 Subpart E	Pass
INDUSTRY CANAD	A RSS-210 Issue 7 Annex 9	Pass
INDUSTRY CAN	ADA 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

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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 <u>http://www.ccsemc.com</u>.

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 model AR5BXB92/IC model AR5BXB92-H. 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.

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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		

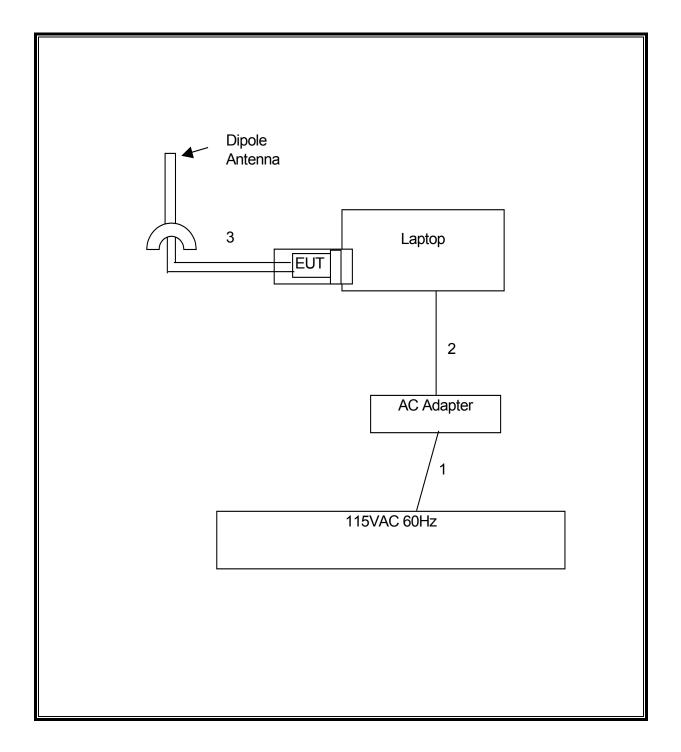
I/O CABLES

	I/O CABLE LIST						
Cable No.	Port	# of Identica 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



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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

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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

<u>LIMITS</u>

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

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

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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	Chain 0 Chain 1		Total
	Power	Power	Power
(MHz)	(dBm)	(dBm)	(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 lowband and mid-band channels.

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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 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each appplicable 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.

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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)

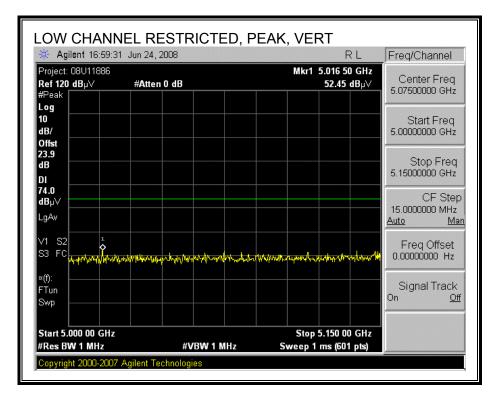
🗧 Agilent 16:44:2	25 Jun 24, 2008	R T	Freq/Channel
Project: 08U11886 Ref 120 dB µ∨ 'Peak	#Atten 0 dB	Mkr1 5.033 75 GHz 50.56 dBµ∀	Center Freq 5.07500000 GHz
.og 0 IB/			Start Freq 5.0000000 GHz
3.9 IB II			Stop Freq 5.1500000 GHz
4.0 Βμ√ gAv			CF Ste 15.000000 MHz <u>Auto M</u> a
1 S2 3 FC импиниции	2 anger af Land and a faith of the start of the start and a faith of the start of the start and a faith of the start and a	white where the second s	Freq Offset 0.00000000 Hz
(f): Tun Wyp			Signal Track On <u>O</u>
itart 5.000 00 GHz Res BW 1 MHz	#VBW 1 MHz	Stop 5.150 00 GHz Sweep 1 ms (601 pts)	

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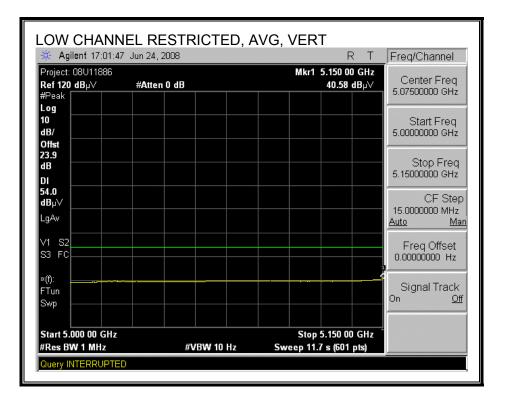
🔆 Agilent 16:45:	NEL RESTRICTED 55 Jun 24, 2008	RL	Freq/Channel
Project: 08U11886 Ref 120 dB µ∨ #Peak	#Atten 0 dB	Mkr1 5.150 00 GHz 38.81 dBµ∀	Center Freq 5.07500000 GHz
Log 10 dB/ Offst			Start Freq 5.0000000 GHz
dB			Stop Freq 5.1500000 GHz
54.0 dBµ∨ LgAv			CF Step 15.000000 MHz <u>Auto Man</u>
V1 S2 S3 FC			Freq Offset 0.00000000 Hz
×(f): FTun Swp			Signal Track On <u>Off</u>
Start 5.000 00 GH #Res BW 1 MHz	z #VBW 10 Hz	Stop 5.150 00 GHz z Sweep 11.7 s (601 pts)	

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RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



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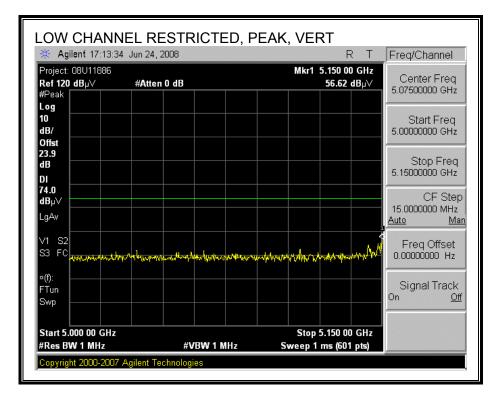
HARMONICS AND SPURIOUS EMISSIONS

iject #: 08U te: 6/25/2003 st Engineer: nfiguration: ode: a Mode st Equipmen Horn 1- T60; S/N: 223 Hi Frequency Ca 2 foot	8 : Tom Cher EUT with I , Tx On (Po <u>at:</u> 18GHz 8 @3m	aptop Darization w	orst cas mplifer Agilent 3	1-260		Pre-am	plifer	26.4000						
nt Engineer: nfiguration: de: a Mode nt Equipmen Horn 1- 60; S/N: 223 fl Frequency Ca	Tom Cher EUT with I , Tx On (Po <u>at:</u> 18GHz 8 @3m	aptop Darization w	mplifer	1-260		Pre-am	plifer	26.40.01						
de: a Mode at Equipment Horn 1- 760; S/N: 223 H Frequency Ca	, Tx On (Pe <u>ut:</u> -18GHz 8 @3m	Pre-ar	mplifer	1-260		Pre-am	plifer	26 40 CU	1					
Horn 1- [60; S/N: 223 Hi Frequency Ca	-18GHz 8 @3m		-		GHz	Pre-am	plifer	26 40 CH						
F 60; S/N: 223 Hi Frequency Ca	8 @3m		-		GHz	Pre-am	plifer	26 40 CU						
Hi Frequency Ca	-	▼ T145 #	Agilent 3	1009 40-		1		20-40GH	z	H	orn > 18	GHz		Limit
	idles			008400	05(•				•	FCC 15.205
	cable	3	3 foot c	able		12	foot c	able		HPF	Re	eject Filte		k Measurements
		•			•	C-5m C	hamb	er 🗸			• R_	001	Avera	W=VBW=1MHz age Measurements 1MHz ; VBW=10Hz
f Dist	Read Pk	Read Avg.	AF	CL	Amp	D Corr	Fltr	Peak	Avg	Pk Lim	Avg Lim	Pk Mar	Avg Mar	Notes
Hz (m)	dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	÷	dBuV/m	dBuV/m	dB	dB	(V/H)
w Ch. 5180 I														-
40 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
540 3.0 A C'h 5220 I	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
d Ch. 5220 1 560 3.0	MHz 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
zh Ch. 5240	Å	44-/	313	0.0	-340	0.0	0.0	20-	30-2	/-	24	-40.0	-4010	T
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
	1													v
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	issions were	detected above	the syste:	m noise	floor									
f	Maggirero	ent Frequenc [,]			Amp	Preamp (Coin				Arra T iro	A verage 1	ield Strengt	h. T. imit
ı Dist	Distance to		ÿ			-		ct to 3 mete	<i>w.c.</i>		Pk Lim	-	d Strength L	
	Analyzer R				Avg			Strength @					. Average L	
AF	Antenna F	0			Peak			k Field Stre					. Peak Limit	
	Cable Los:				HPF	High Pas			0			8		
CL	CHOIC TROS													

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

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



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🔆 Agilent 17:17:	42 Jun 24, 2008	RT	Freq/Channel
Project: 08U11886 Ref 120 dB µV #Peak	#Atten 0 dB	Mkr1 5.150 00 GHz 42.69 dBµ∨	Center Freq 5.07500000 GHz
Log 10 dB/			Start Freq 5.0000000 GHz
Offst 23.9 dB DI			Stop Freq 5.1500000 GHz
54.0 dBµ∨ LgAv			CF Step 15.0000000 MHz Auto Mar
V1 S2			Freq Offset 0.00000000 Hz
×(f): FTun Swp			Signal Track On <u>Off</u>
Start 5.000 00 GHz #Res BW 1 MHz	2 #VBW 10 Hz	Stop 5.150 00 GHz Sweep 11.7 s (601 pts)	

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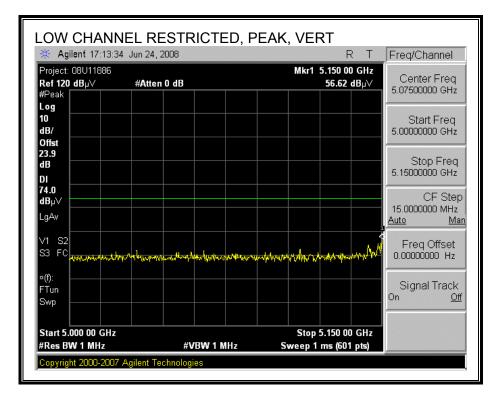
HARMONICS AND SPURIOUS EMISSIONS

st En		Tom Cher													
~		EUT with I /Iode, Tx C	Laptop)n (Polarizati	on wors	t case	: Vertic	al)								
st Eq	uipmer	<u>it:</u>													
н	orn 1	18GHz	Pre-ar	nplifer	1-260	GHz	Pre-am	plifer	26-40GH	z	н	orn > 1	8GHz		Limit
T60; S	5/N: 223	8 @3m	▼ T145 A	gilent 3	008A00	05(🖵				-				-	FCC 15.205 🗸
Hi Freq	luency Ca	ibles —													
	2 foot	cable	3	foot c	able		121	foot c	able		HPF	F	Reject Filte		<u>k Measurements</u> 3W=VBW=1MHz
			•			•	C-5m C	hamb	er 🗸			•	R_001	Avera	age Measurements =1MHz ; VBW=10Hz
f	Dist	Read Pk	Read Avg.	AF	CL	Amp	D Corr	Fltr	Peak	Avg	Pk Lim	Avg Li	n Pk Mar	Avg Mar	Notes
Hz	(m)	dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/	n dB	dB	(V/H)
w Ch. 540	. 5180 . 3.0	MHz 42.0	22.0	38.0	0.0	-32.3	0.0	0.0	47.7	27.7	74	54	-26.3	-26.3	Н
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
1a Cn. 660	. 5220	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
	n. 5240														
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
z. 4.12.5 te: No c	f Dist Read	Measurem Distance to Analyzer B	Reading			Amp D Corr Avg	Average	Corre Field S	ct to 3 mete Strength @	3 m		Pk Lim Avg Ma	r Margin vs	d Strength I . Average I	.imit .imit
	AF CL	Antenna F Cable Los				Peak HPF	Calculate High Pas:		c Field Stre	ngin		FK Mar	Margin vs	. Peak Lim	

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

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



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🔆 Agilent 17:17:	42 Jun 24, 2008	RT	Freq/Channel
Project: 08U11886 Ref 120 dB µV #Peak	#Atten 0 dB	Mkr1 5.150 00 GHz 42.69 dBµ∨	Center Freq 5.07500000 GHz
Log 10 dB/			Start Freq 5.0000000 GHz
Offst 23.9 dB DI			Stop Freq 5.1500000 GHz
54.0 dBµ∨ LgAv			CF Step 15.0000000 MHz Auto Mar
V1 S2			Freq Offset 0.00000000 Hz
×(f): FTun Swp			Signal Track On <u>Off</u>
Start 5.000 00 GHz #Res BW 1 MHz	2 #VBW 10 Hz	Stop 5.150 00 GHz Sweep 11.7 s (601 pts)	

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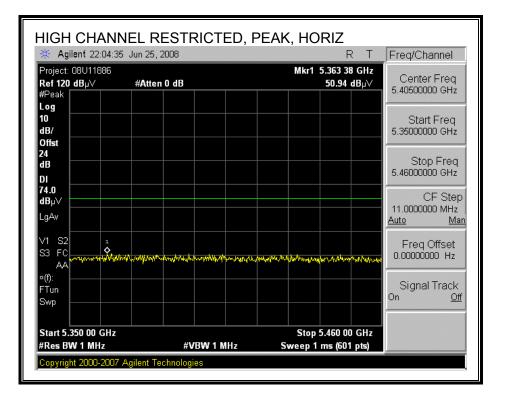
HARMONICS AND SPURIOUS EMISSIONS

maa	w Athe	ares Comm	unications, 1	Inc											
	#: 08U		.unications, 1	me.											
	25/2008														
		Tom Cher EUT with I													
)n (Polarizati	ion wors	t case	: Vertica	al)								
st Ea	uipmen	ıt:													
		_					_								
		-18GHz		mplifer			Pre-am	plifer	26-40GH	z	н	orn > 18	GHz		Limit
T60; S	5/N: 223	8 @3m	▼ T145 A	Agilent 3	008A0	05(🚽				-				-	FCC 15.205
Hi Freq	luency Ca	bles													
	2 foot	cable	3	3 foot c	able		12	foot c	able		HPF	R	eject Filte		<u>k Measurements</u> W=VBW=1MHz
						•	C-5m C	hamb	er 🗸			→ R	_001	Avera	age Measurements
														RBW=	=1MHz ; VBW=10Hz
f	Dist		Read Avg.		CL	Amp	D Coit		Peak	Avg	Pk Lim			Avg Mar	
GHz	(m) . 5190 I	dBuV MH-	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)
.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	Н
570 ah Ch	3.0 1. 5230	42.5 MH-	22.5	38.0	0.0	-32.3	0.0	0.0	48.2	28.2	74	54	-25.8	-25.8	v
1gn 01 5.690	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
		1				•									V H
				1			+		-						H
ev. 4.12.1 ote: No c			detected above		m noise	floor Amp	Preamp	Gain				AvaTim	Average .	Field Strengt	th T imit
	Dist	Distance to	•	,		*	-		ct to 3 mete	rs		Pk Lim		d Strength L	
		Analyzer B				Avg	-		Strength @			-	-	s. Average L	
	AF CL	Antenna F Cable Los				Peak HPF	Calculate High Pas		k Field Stre:	ngth		Pk Mar	Margin v:	s. Peak Limi	t
		Cable Los						s ruter							

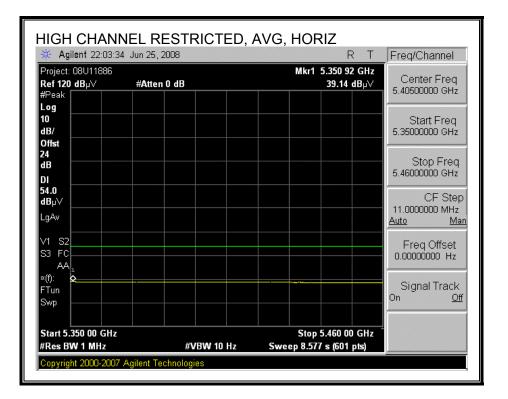
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8.2.3. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE UPPER 5.2 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

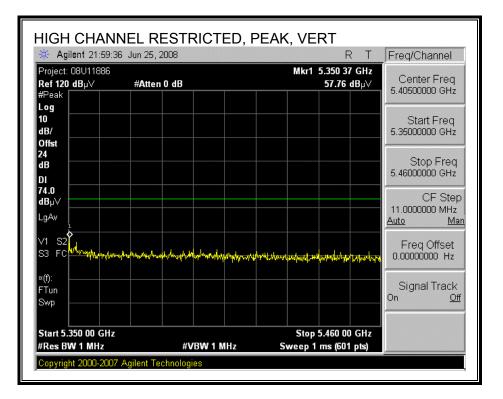


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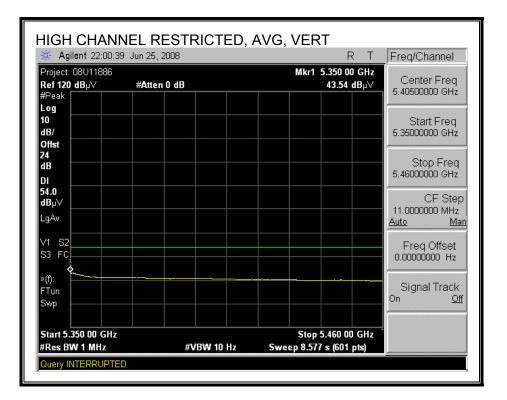


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RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



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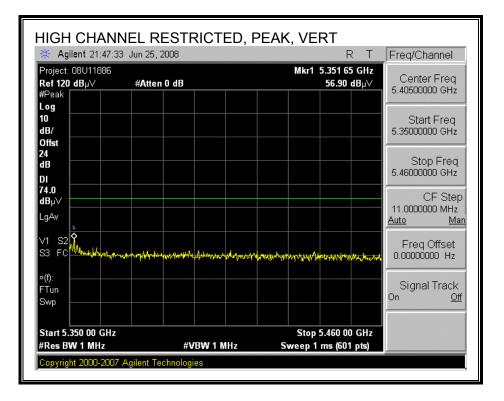
HARMONICS AND SPURIOUS EMISSIONS

I Frequency Cables 2 foot cable v f Dist Read Pk Read Av Hz (m) dBuV dBuV dBuV v Ch. 5260 MHz 80 3.0 41.0 21.0 80 3.0 41.0 21.0 80 3.0 41.0 21.0 80 3.0 41.0 21.0 80 3.0 41.0 21.0 80 3.0 41.0 21.0 80 3.0 41.0 21.0 80 80 1.0 21.0 80 1.0 21.0 80 1.0 21.0 80 1.0 21.0 80 1.0 21.0 80 1.0 21.0 80 1.0 21.0 80 1.0 21.0 80 1.0 21.0 80 1.0 21.0 80 1.0 21.0 80 1.0 21.0 80 1.0 21.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1	dB/m dB	e V	12 C-5m C				HPF	Re	eject Filte	RB	FCC 15.205
2 foot cable f Dist Read Pk Read Av Hz (m) dBuV dBuV cCh. 5260 MHz 80 3.0 41.0 21.0 80 3.0 43.5 23.5 1Ch. 5300 MHz 00 3.0 41.0 21.0	vg. AF CL dB/m dB 379 0.0	• Amp	C-5m C	Chambo			HPF			RB	
Hz (m) dBuV dBuV v Ch. 5260 MHz 80 3.0 41.0 21.0 80 3.0 43.5 23.5 1	dB/m dB	. Amp			er 🗸			- R			
Hz (m) dBuV dBuV v Ch. 5260 MHz 80 3.0 41.0 21.0 80 3.0 43.5 23.5 1	dB/m dB		D Coit						001		<u>ge Measurements</u> 1MHz ; VBW=10Hz
v Ch. 5260 MHz 80 3.0 41.0 21.0 80 3.0 43.5 23.5 1 Ch. 5300 MHz 00 3.0 41.0 21.0	37.9 0.0	<u>ш</u>	dB	Fltr dB	Peak dBaV/aa	Avg dBuV/m	Pk Lim		Pk Mar dB	Avg Mar dB	Notes (V/H)
80 3.0 43.5 23.5 Ch. 5300 MHz 0 3.0 41.0 21.0			<u>an</u>	<u>ав</u>	aBu v/m	aBu v/m	aBu v/m	abu v/m		шь	(V/H)
Ch. 5300 MHz 0 3.0 41.0 21.0	1 22 0 1 0 0		0.0 0.0	0.0 0.0	46.7 49.2	26.7 29.2	74 74	54 54	-27.3 -24.8	-27.3 -24.8	H V
	37.9 0.0	-32.2	4.0		49.2	29.2	74	24	-24.8	-24.8	Y
	37.4 0.0		Q.O	0.0	44.1	24.1	74	54	-29.9	-29.9	v
0 3.0 45.1 25.1 .Ch. 5320 MHz	37.9 0.0	-32.2	0.0	0.0	50.7	30.7	74	54	-23.3	-23.3	v
0 3.0 41.0 21.0	37.3 0.0		0.0	0.0	44.1	24.1	74	54	-29.9	-29.9	V
0 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
									ļ		
					<u></u>				Í	<u> </u>	
.12.7 No other emissions were detected abo	we the custom noi	ice floor									
f Measurement Freque Dist Distance to Antenna	ency	Amp D.C	Preamp (ct to 3 mete					Field Strengtl d Strength Li	
Read Analyzer Reading		Avg			Strength @					. Average Li	
AF Antenna Factor		Peak	-		k Field Stre			-	-	. Peak Limit	
CL Cable Loss		HPF	High Pas	s Filter							

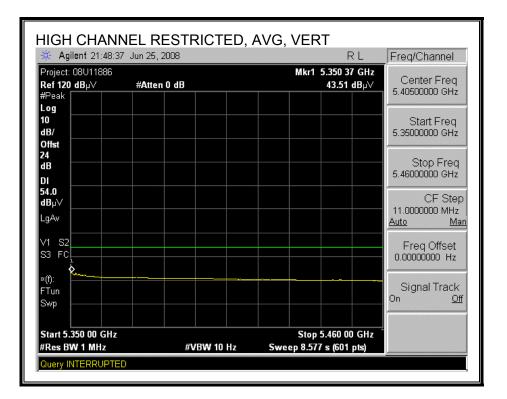
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8.2.4. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE UPPER 5.2 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



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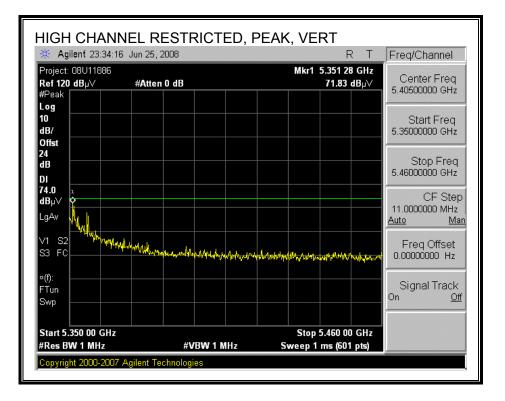
HARMONICS AND SPURIOUS EMISSIONS

Hz (m)	s ——		lgilent 3 foot c		05(12							•	FCC 15.205
2 foot ca f Dist F Hz (m)		3	foot c	able		121								
Hz (m)						121	foot c	able		HPF	Re	eject Filte		<u>x Measurements</u> W=VBW=1MHz
Hz (m)					•	C-5m C	hambe	er 🔻			• R	001		<u>ge Measurement</u> 1MHz ; VBW=10H
	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
w Ch. 5260 MI	Hz											ĺ		
'80 3.0 '80 3.0	56.8 59.2	42.5 44.8	37.9 37.9	0.0 0.0	-32.2 -32.2	0.0 0.0	0.0 0.0	62.5 64.9	48.2 50.5	74 74	54 54	-11 <i>5</i> -9.1	-5.8 -3.5	H V
l Ch. 5300 MI								10.5						
00 3.0 00 3.0	45.2 57.6	31.8 43.9	37.4 37.9	0.0 0.0	-34.3 -32.2	0.0 0.0	0.0 0.0	48.3 63.2	34.9 49.5	74 74	54 54	-25.7 -10.8	-19.1 -4.5	v v
gh Ch. 5320 M														
540 3.0 960 3.0	41.0 43.1	21.0 23.1	37.3 37.8	0.0 0.0	-34.2 -32.2	0.0 0.0	0.0 0.0	44.1 48.7	24.1 28.7	74 74	54 54	-29.9 -25.3	-29.9 -25.3	v v
. 4.12.7														
e: No other emissi	ions were d	etected above t	the system	m noise	floor									
		nt Frequency	7		-	Preamp (-	-	Field Strengt	
Dist D: Read A:	istance to				D Corr Avg			ct to 3 mete Strength @			Pk Lim Aug Mar		d Strength Li : Average Li	
	intenna Fa	-			Peak	-		t Field Stre			-	-	. Average Li . Peak Limit	
	able Loss					High Pas			0			0		

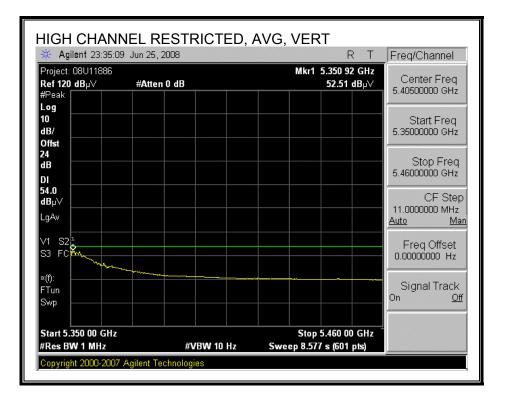
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8.2.5. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE UPPER 5.2 GHz BAND

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



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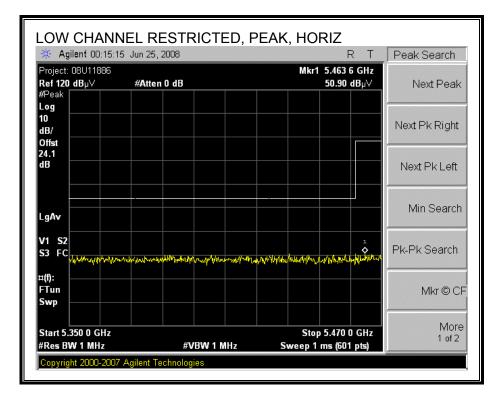
HARMONICS AND SPURIOUS EMISSIONS

	ace Ce	rtification	Services,	Fremont	5m Ch	amber									
		ros Comm	unications	, Inc.											
	: 08U 5/2008														
		, Tom Chen													
		EUT with L													
ode: H	T20 M	lode, Tx O	n (Polariz	ntion wor	st case	: Vertic	al)								
st Equ	ipmen	<u>t:</u>													
Ho	orn 1-	18GHz	Pre	amplife	1-26	GHz	Pre-am	plifer	26-40GH	z	н	orn > 1	BGHz		Limit
T60; S/	/N: 223	8 @3m	▼ T14	5 Agilent	3008A0	05(🖵				-				-	FCC 15.205
Hi Frequ	iency Cal	bles													,
2	2 foot	cable		3 foot (able		12	footo	able		HPF	F	eject Filt		<u>k Measurements</u> 3W=VBW=1MHz
		-				•	C-5m C	hamb	er 🗸			•	2_001		age Measurements =1MHz ; VBW=10Hz
f	Dist	- Read Pk	Read Av	g. AF	CL	Amp	D Сон	Fltr	Peak	Avg	Pk Lim	AvgLin	Pk Mar	Avg Mar	
Hz	(m)	dBuV	dBuV	dB/m	1	dB	dB	dB	1	-	dBuV/m	-	1	dB	(V/H)
	52.70 I														
810 810	3.0 3.0	51.5 53.9	39.3 41.4	37.9 37.9	0.0 0.0	-32.2 -32.2	0.0 0.0	0.0 0.0	57.1 59.5	44.9 47.0	74 74	54 54	-16.9 -14.5	-9.1 -7.0	H V
	5310		41,4	3/3	0.0	-34.4	0.0	0.0	393	47,0	/4	- 24	-14.5	-7-0	•
520	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
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
		L				L			l						
. 4.12.7															
e: No ot	iher emi	issions were o	letected abo	ve the syste	m noise	floor									
;	f	Measureme	ent Freque	ncy		Amp	Preamp	Gain				Avg Lim	Average 3	Field Streng	th Limit
		Distance to							ct to 3 mete			Pk Lim		d Strength I	
		Analyzer R	-			Avg			Strength @					s. Average I	
	AF	Antenna Fa				Peak.			c Field Stre	ngth		Pk Mar	Margin v	s. Peak Limi	t
	CL	Cable Loss				HPF	High Pas	s rutei							

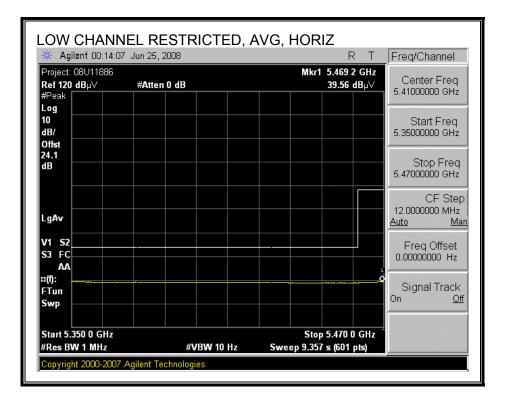
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8.2.6. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE 5.6 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

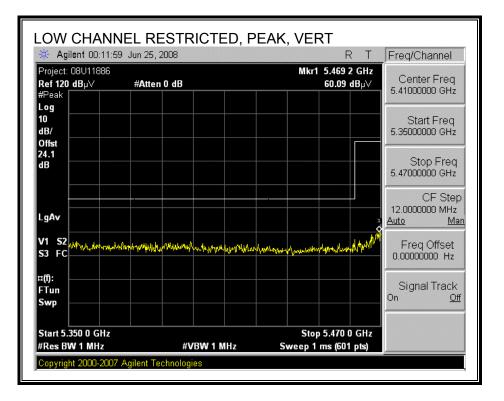


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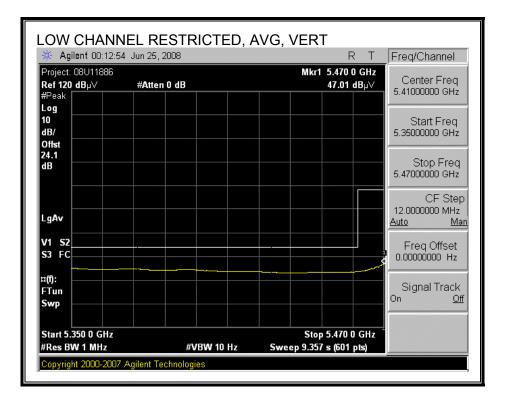


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RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

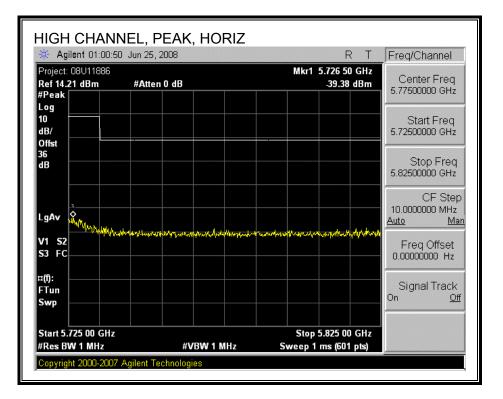


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AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

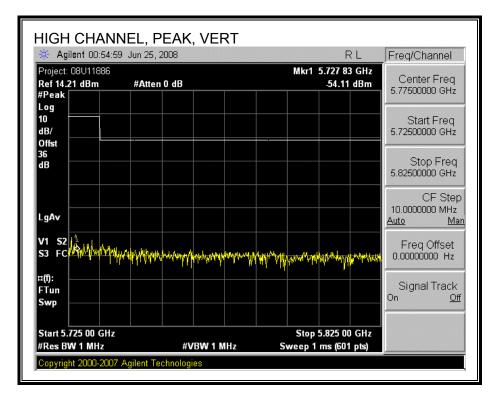


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🔆 Agilent 01:02:4	1 Jun 25, 2008	RL	Freq/Channel
Project: 08U11886 Ref 14.21 dBm #Peak	#Atten 0 dB	Mkr1 5.725 17 GHz -52.85 dBm	Center Freq 5.77500000 GHz
Log 10 dB/ Offst			Start Freq 5.72500000 GHz
dB			Stop Freq 5.82500000 GHz
LgAv			CF Step 10.000000 MHz <u>Auto Mar</u>
V1 S2 S3 FC			Freq Offset 0.00000000 Hz
¤(f): FTun Swp			Signal Track On <u>Off</u>
Start 5.725 00 GHz #Res BW 1 MHz	#VBW 10 H	Stop 5.825 00 GHz z Sweep 7.797 s (601 pts)	

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AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)



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🔆 Agilent 00:57:23	3 Jun 25, 2008	RT	Freq/Channel
Project: 08U11886 Ref 14.21 dBm #Peak	#Atten 0 dB	Mkr1 5.725 17 GHz -40.74 dBm	Center Freq 5.77500000 GHz
Log 10 dB/ Offst			Start Freq 5.72500000 GHz
dB			Stop Freq 5.82500000 GHz
LgAv 👌			CF Step 10.0000000 MHz <u>Auto Mar</u>
V1 S2 S3 FC			Freq Offset 0.00000000 Hz
¤(f): FTun Swp			Signal Track On <u>Off</u>
Start 5.725 00 GHz #Res BW 1 MHz	#VBW 10 Hz	Stop 5.825 00 GHz Sweep 7.797 s (601 pts)	

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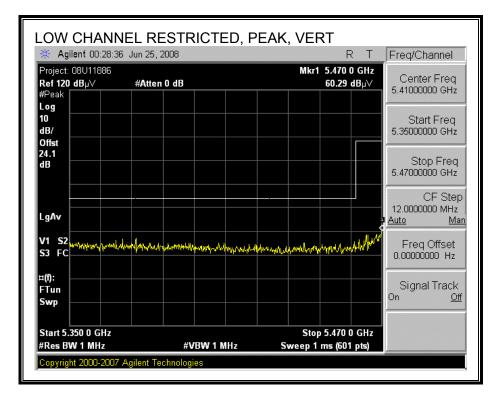
HARMONICS AND SPURIOUS EMISSIONS

It requency Cables It requen			18GHz		nplifer			Pre-am	plifer	26-40GH	z	Н	orn > 18(GHz		Limit
2 foot cable 3 foot cable 12 foot cable HPF Reject Filter Peak Measuremen 1			•	▼ T145 #	Agilent 3	008A0	05(•	FCC 15.205
C-5m Chamber f Dist Read Avg. AF CL Amp D Corr Fltr Peak Avg Pk Lim Avg Lim Pk Mar Avg Mar Notes Hz (m) dBuV dBnv dB dB dB dB dB dB dB (V/H) v Ch. 5500 MHz 0 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 000 3.0 443.3 26.0 37.3 0.0 -33.8 0.0 0.0 48.9 29.6 74 54 -30.2 -29.8 H 000 3.0 44.3 26.0 37.3 0.0 -33.5 0.0 0.0 48.9 29.6 74 54 -29.1 -28.6 V 000 3.0 41.0 21.5 37.3 0.0 -33.2 0.0 0.0 44.9 25.4 74 54 -29.1 -28.6 V 00 3.0				3	foot c	able		12 1	foot c	able		HPF	Re	ject Filte		
HZ (m) dBuV dBuV dBm dB dV/m dBuV/m dBuV/m dBuV/m dB dB dB (V/H) vc h. 5500 MHz 0 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 000 3.0 45.3 26.0 37.3 0.0 -33.8 0.0 0.0 48.9 29.6 74 54 -29.1 -24.4 V 40 Ch. 5000 MHz -				•			•	C-5m C	hambe	er 🔽			• R_	001	Avera	ge Measurements
v Ch. 5500 MHz 0 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 00 3.0 45.3 26.0 37.3 0.0 -33.8 0.0 0.0 43.8 24.2 74 54 -30.2 -29.8 H 00 3.0 45.3 26.0 37.3 0.0 -33.5 0.0 0.0 48.9 29.6 74 54 -29.1 -28.6 V d Ch. 5600 MHz 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 ol 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 ol 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 st			1	-				1			-		-		-	Notes (V/H)
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 d Ch. 5600 MHz 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 00 3.0 41.5 21.4 37.4 0.0 -33.2 0.0 0.0 44.9 25.4 74 54 -29.1 -28.6 V 00 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 00 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 4.12.7 Extorement Frequency Amp Preamp Gain Avg Lim Average Field Strength Limit Pk Lim Peak Field Strength Limit Dist Distance to Anterna D Corr Distance Correct to 3 meter	v Ch. 5	500 1	MHz													
00 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 0 3.0 41.5 21.4 37.4 0.0 -33.2 0.0 0.0 44.9 25.4 74 54 -29.1 -28.6 V 00 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 4.12.7 : : No other emissions were detected above the system noise floor																
h Ch. 5700 MHz 00 -33.2 0.0 0.0 45.6 25.5 74 54 -28.4 -28.5 V 00 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 4.12.7 1. No other emissions were detected above the system noise floor f Measurement Frequency Amp Preamp Gain Average Field Strength Limit Dist Distance to Antenna D Corr Distance Correct to 3 meters Pk Lim Peak Field Strength Limit Read Analyzer Reading Average Field Strength @ 3 m Average Limit				21.5	37.3	٥ŋ	-33.5	٦U	nn	44.9	25.4	74	54	-29.1	-28.6	v
4.12.7 4.12.7 2. No other emissions were detected above the system noise floor f Measurement Frequency Amp Preamp Gain Dist Distance to Antenna D Corr Distance Correct to 3 meters Read Analyzer Reading Avg Average Field Strength @ 3 m Average Field Strength Limit Avg Mar Margin vs. Average Limit	h Ch. 5	5700	MHz													
:: No other emissions were detected above the system noise floor f Measurement Frequency Amp Preamp Gain 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	00	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
:: No other emissions were detected above the system noise floor f Measurement Frequency Amp Preamp Gain 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																
	f D R A	Dist ≷ead NF	Measureme Distance to Analyzer R Antenna Fa	ent Frequenc Antenna eading actor			Amp D Corr Avg Peak	Distance Average Calculate	Correc Field S d Peak	Strength @ Field Stre	3 m		Pk Lim Avg Mar	Peak Fiel Margin vs	d Strength Li . Average Li	imit imit
CL Cable Loss HPF High Pass Filter	C	CL	Cable Loss				HPF	High Pas	s Filter							

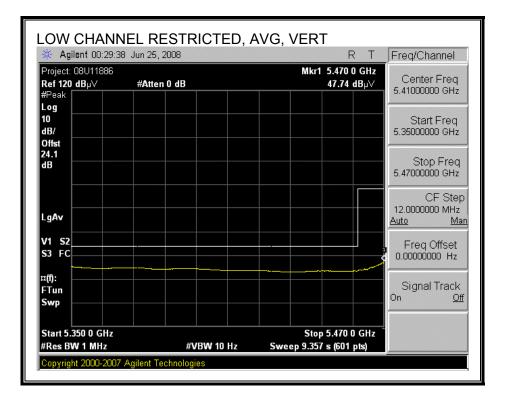
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8.2.7. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 5.6 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

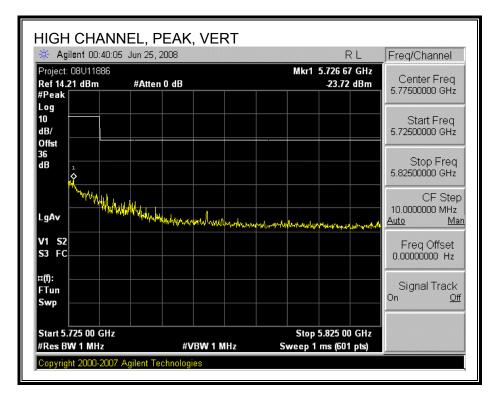


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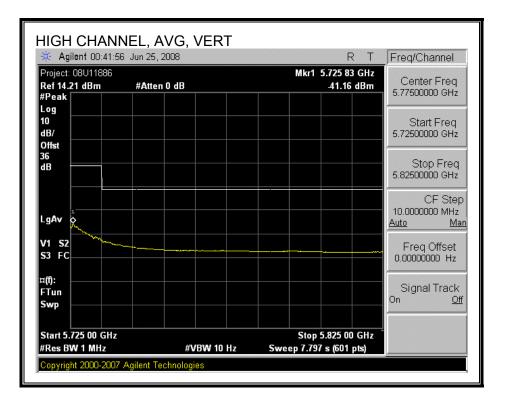


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AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)



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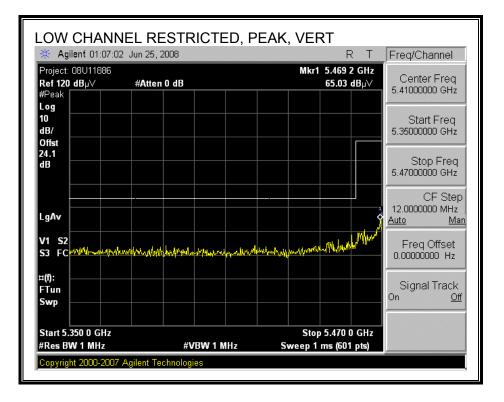
HARMONICS AND SPURIOUS EMISSIONS

Н	orn 1-	18GHz		nplifer			Pre-am	plifer	26-40GH	z	н	orn > 18	GHz		Limit
		8 @3m	▼ T145 A	gilent 3	008A0	05(🗸				•				•	FCC 15.205
	uency Ca <mark>2 foot</mark>	cable	3	foot c	able		12 1	foot c	able		HPF	Re	ject Filte		<u>k Measurements</u> W=VBW=1MHz
			•			•	C-5m C	hambe	er 🔽			• R_	001	Avera	ge Measurements 1MHz ; VBW=10Hz
f	Dist		Read Avg.	AF	CL	Amp	D Corr	Fltr	Peak	Avg				Avg Mar	Notes
Hz v Ch.	(m) 5500]	dBuV MHz	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)
00 00	3.0 3.0	40.3 41.8	21.0 22.0	37.3 37.3	0.0 0.0	-33.8 -33.8	0.0 0.0	0.0 0.0	43.9 45.4	24.6 25.6	74 74	54 54	-30.1 -28.6	-29.4 -28.4	H V
	5600]		22,0	3/3	0.0	-33.0	0.0	0.0	45,4	25,0	74	24	-20.0	-20.4	¥
00	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
h Ch 00	. 5700 3.0	MHz 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
	ther em f Dist		eading		n noise	Amp	Average 3	Correc Field S	ct to 3 mete Strength @ c Field Stre	3 m		Pk Lim Avg Mar	Peak Fiel Margin vs	Field Strengt d Strength L Average L Peak Limit	imit imit
	CL	Cable Loss	•			HPF	High Pas:	s ruter							

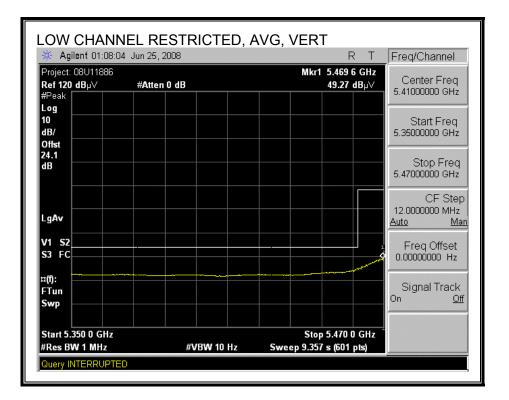
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8.2.8. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE 5.6 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

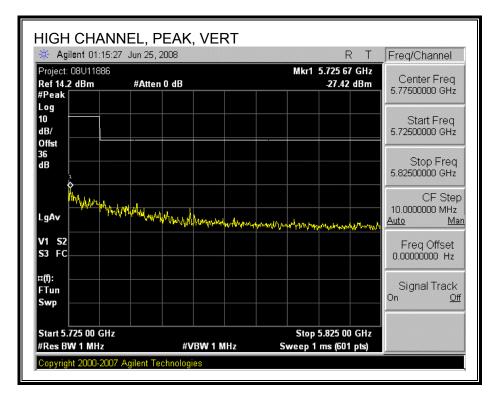


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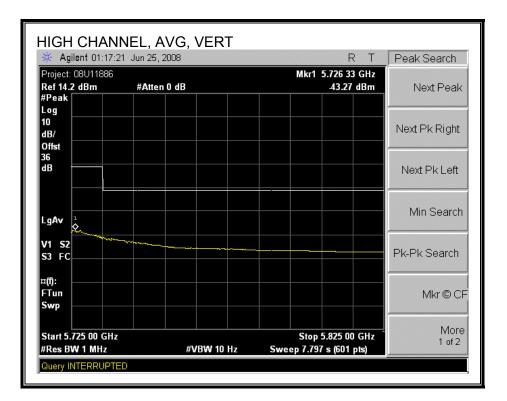


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AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)



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HARMONICS AND SPURIOUS EMISSIONS

Image game Image game <th></th> <th></th> <th>18GHz</th> <th></th> <th>nplifer</th> <th></th> <th></th> <th>Pre-am</th> <th>plifer</th> <th>26-40GH</th> <th>z</th> <th>Н</th> <th>orn > 18</th> <th>GHz</th> <th></th> <th>Limit</th>			18GHz		nplifer			Pre-am	plifer	26-40GH	z	Н	orn > 18	GHz		Limit
2 foot cable 3 foot cable 12 foot cable HPF Reject Filter Peak Measurement RBW=VBW=1MHz v <td< th=""><th></th><th></th><th>-</th><th>▼ T145 A</th><th>gilent 3</th><th>008A0</th><th>05(</th><th></th><th></th><th></th><th><u> </u></th><th></th><th></th><th></th><th>•</th><th>FCC 15.205</th></td<>			-	▼ T145 A	gilent 3	008A0	05(<u> </u>				•	FCC 15.205
Image: constraint of the system noise floor Result of the system noise floor 1 3.0 40.2 20.4 37.4 0.0 33.5 0.0 0.0 44.2 24.0 74 54 -29.8 -30.0 H 1 3.0 41.3 21.2 37.3 0.0 -33.5 0.0 0.0 44.2 24.0 74 54 -29.8 -30.0 H 1 3.0 41.3 21.2 37.3 0.0 -33.5 0.0 0.0 44.2 24.0 74 54 -29.8 -30.0 H 1 3.0 41.3 21.2 37.3 0.0 -33.5 0.0 0.0 47.1 28.8 74 54 -26.9 -25.2 V 1 3.0 40.2 20.4 37.4 0.0 -33.3 0.0 0.0 441.3 24.5 74 54 -29.7 -29.				3	foot c	able		12	foot c	able		HPF	Re	eject Filte		
z (m) dBuV dBuV dB dB dB dB dB dB dB dB dW/m dBuV/m dB dB dB (V/H) Ch. 5510 MHz 1 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 3.0 41.3 21.2 37.3 0.0 -33.5 0.0 0.0 44.2 24.0 74 54 -29.8 -30.0 H 5500 MHz -				•			•	C-5m C	hambo	er 🔽			• R_	001		
Ch. 5510 MHz 30 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 3.0 41.3 21.2 37.3 0.0 .33.5 0.0 0.0 45.2 25.1 74 54 .29.8 .30.0 H 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 Ch. 5500 MHz	f Hz													1		
1 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 1 3.0 43.3 25.0 37.3 0.0 .33.5 0.0 0.0 45.2 25.1 74 54 .28.8 .28.9 V 1 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 1 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 1 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 12.7 vo ther emissions were detected above the system noise floor	7 Ch. 5	55101	MHz													
Ch. 5590 NHz Ch. 5590 NHz Ch. 5570 MHz Ch. 5670 MHz Ch. 570 MH	10 10															
Ch. 5670 MHz O 33.3 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 1 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 12.7 No other emissions were detected above the system noise floor Image: Control of the system noise floor 12.7 No other emissions were detected above the system noise floor Image: Control of the system noise floor Image: Control of the system noise floor Image: Control of the system noise floor 12.7 No other emissions were detected above the system noise floor Image: Control of the system noise floor 12.7 Image: Control of the system noise floor Image: Con	Ch. 5	5590 1	√IHz				<u> </u>			1		•				5
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 Image: Second Secon	00		Å	25.0	37.3	0.0	-33.5	0.0	0.0	47.1	28.8	74	54	-26.9	-25.2	v
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	0			20.4	37.4	0.0	-33.3	0.0	0.0	44.3	24.5	74	54	-29.7	-29.5	v
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																
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							•			•						
Dist Distance to Anterna 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	4.12.7 : No otl	her emi	ssions were d	letected above 1	the system	n noise	floor									
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	f	f	Measureme	ent Frequency	7		Amp	Preamp (Gain				Avg Lim	Average I	Field Streng	th Limit
AF Antenna Factor Peak Calculated Peak Field Strength Pk Mar Margin vs. Peak Limit																
o 0							-									
											ngui		F K. IVIAI	Iviaigii və	. FCaR LIIII	L

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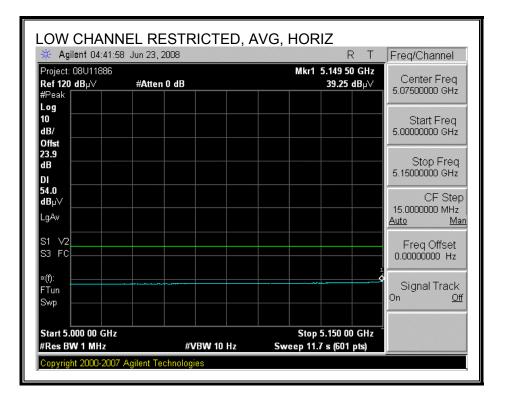
8.3. TRANSMITTER ABOVE 1 GHz (FEM #2)

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

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

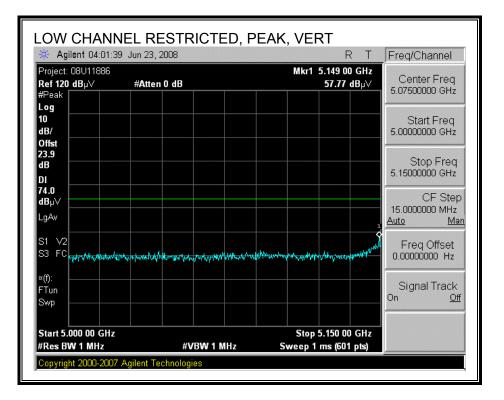
🔆 Agilent 04:41:01 Ju	. RESTRICTED, P n 23, 2008	, R T	Freq/Channel
#Peak	Atten 0 dB	Mkr1 5.062 75 GHz 50.83 dBµ∨	Center Freq 5.07500000 GHz
Log 10 dB/ Offst			Start Freq 5.00000000 GHz
23.9 4B			Stop Freq 5.1500000 GHz
/4.0 dBμV _gAv			CF Step 15.0000000 MHz Auto Ma
51 V2 53 FC	Manhonarange	and war with man marked and the and the second	Freq Offset 0.00000000 Hz
×(f): FTun Swp			Signal Track On <u>Of</u>
Start 5.000 00 GHz /Res BW 1 MHz	#VBW 1 MHz	Stop 5.150 00 GHz Sweep 1 ms (601 pts)	

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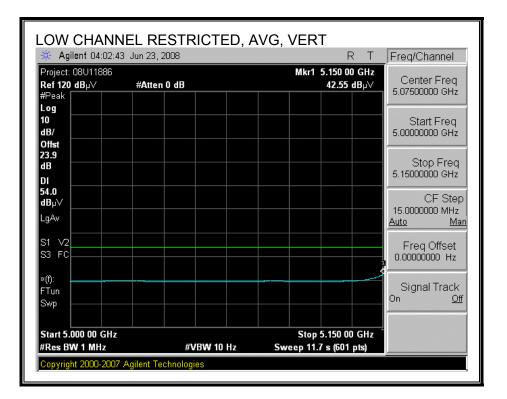


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RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

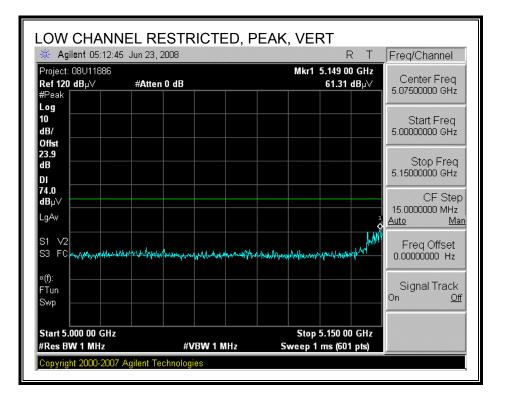


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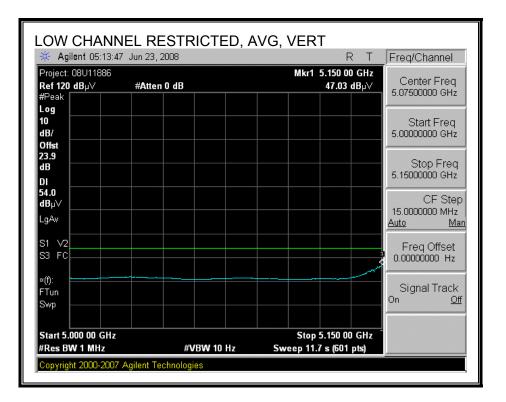


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RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



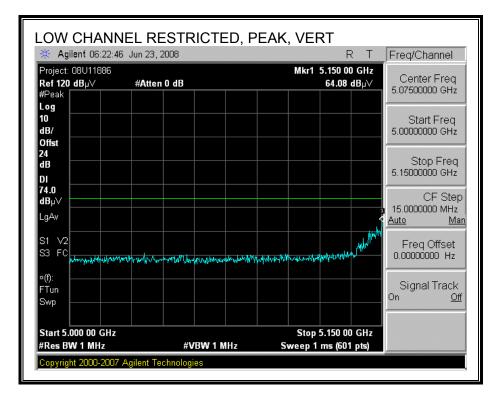
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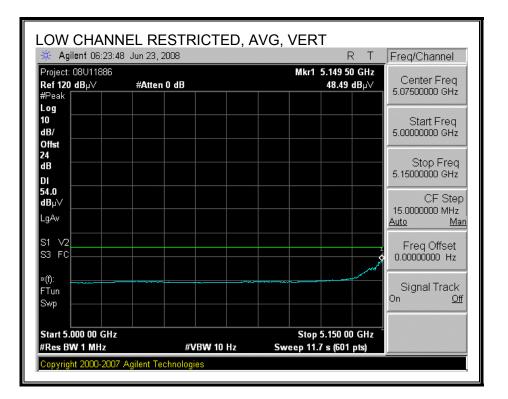
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8.3.2. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE LOWER 5.2 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



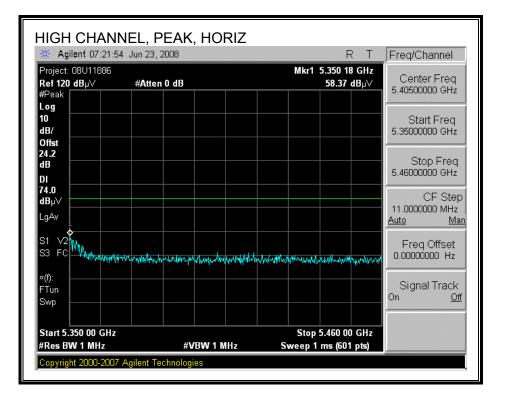
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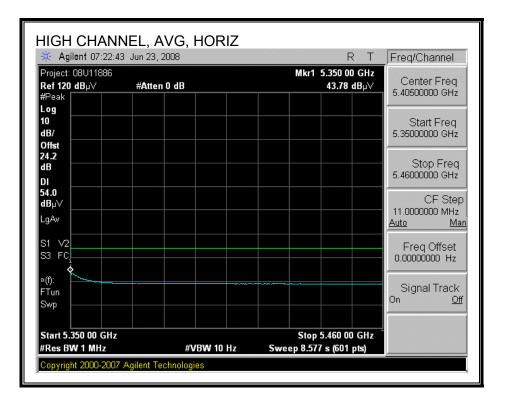
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8.3.3. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE UPPER 5.2 GHz BAND

AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

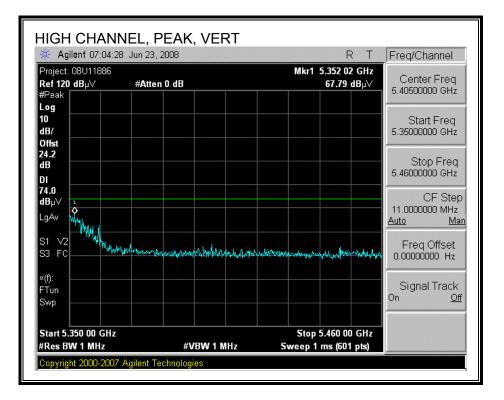


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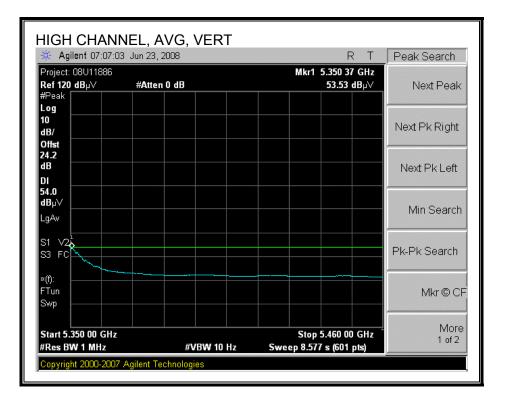


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AUTHORIZED BANDEDGE (LOW CHANNEL, VERTICAL)



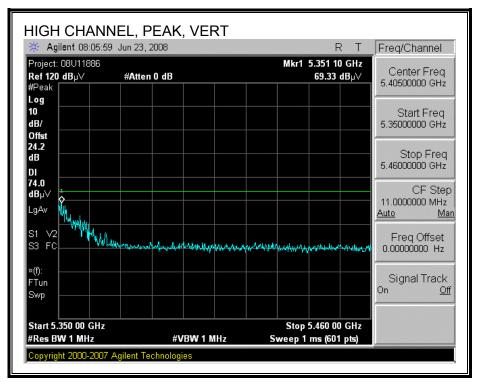
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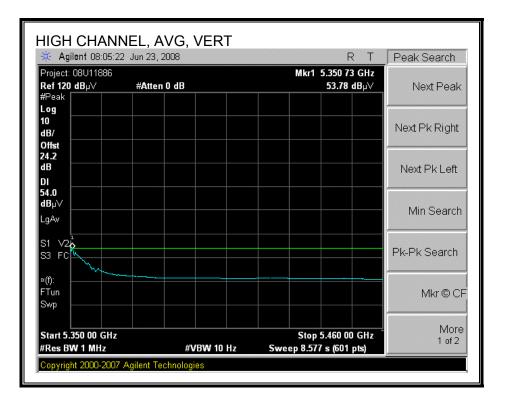
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8.3.4. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE UPPER 5.2 GHz BAND





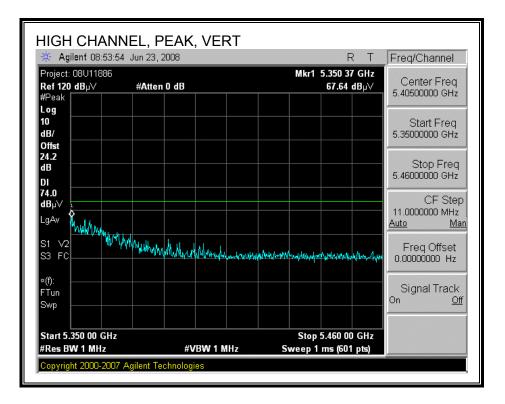
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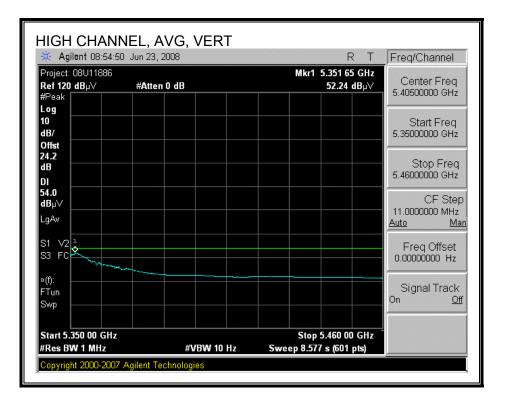
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8.3.5. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE UPPER 5.2 GHz BAND

AUTHORIZED BANDEDGE (LOW CHANNEL, VERTICAL)



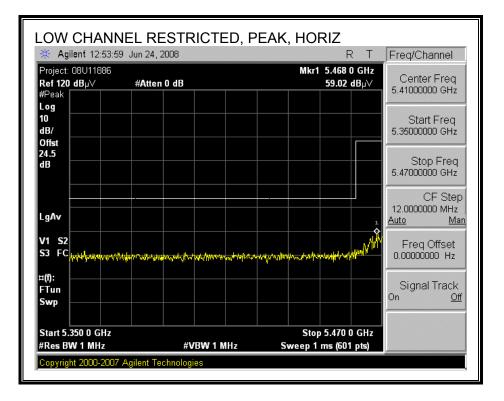
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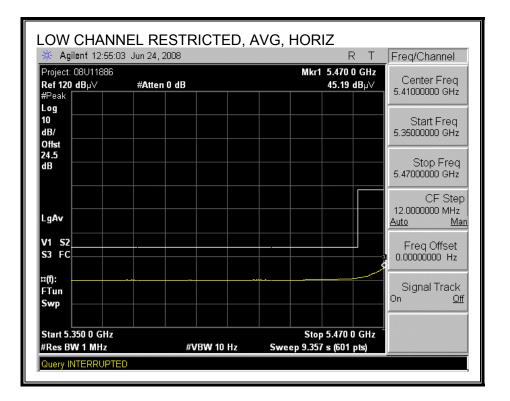
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8.3.6. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE 5.6 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

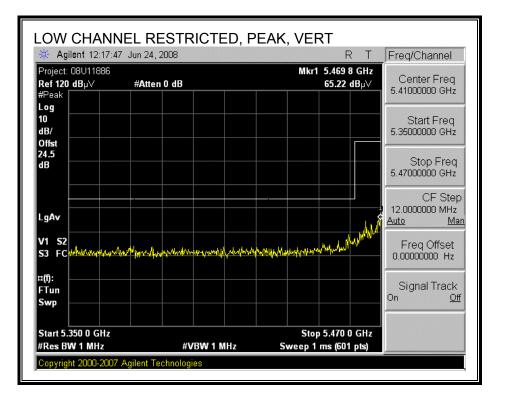


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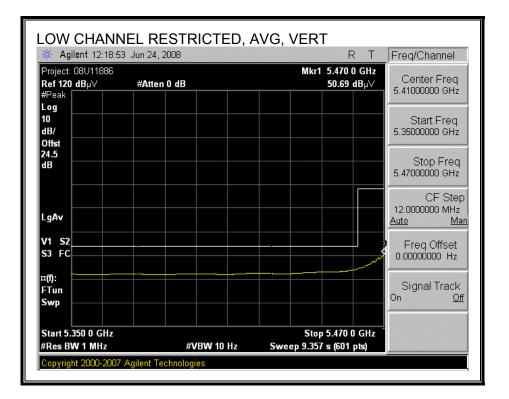


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RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

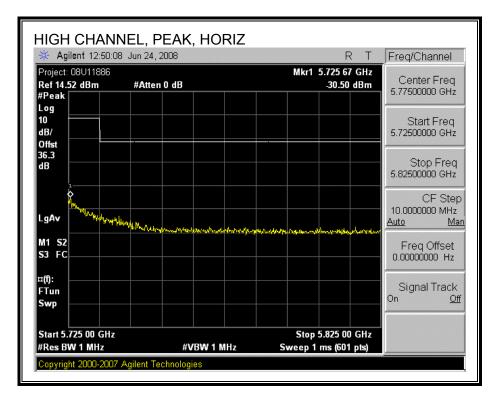


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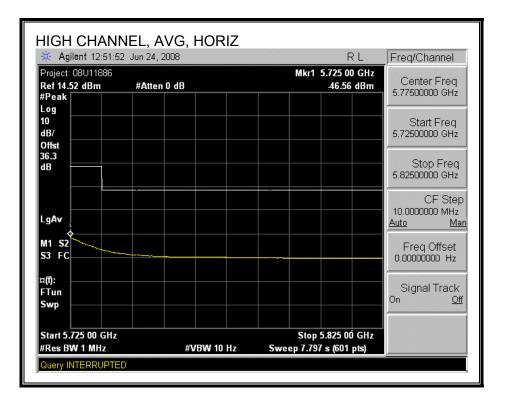


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AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

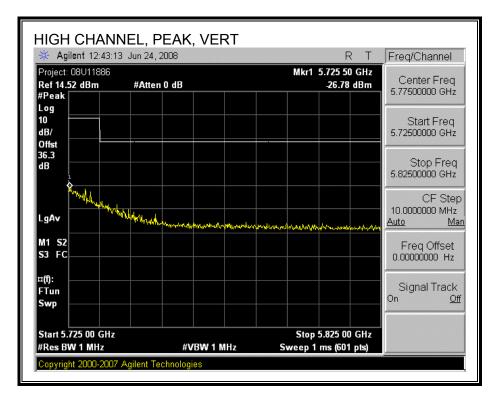


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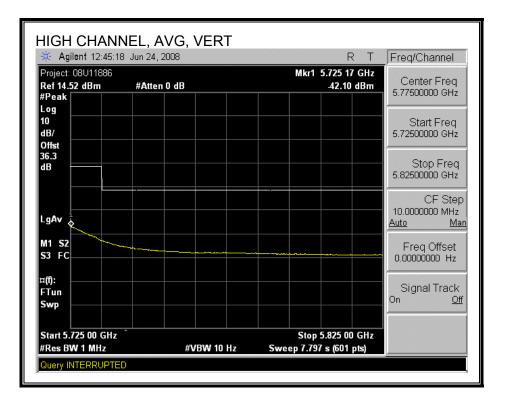


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AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)



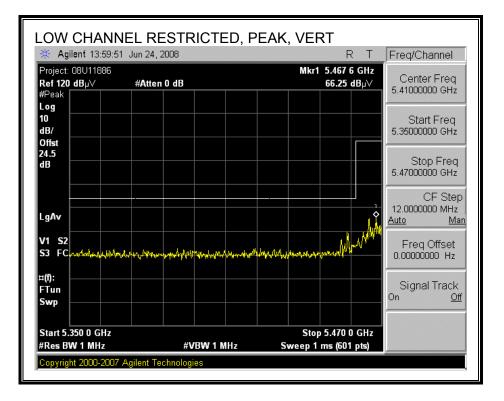
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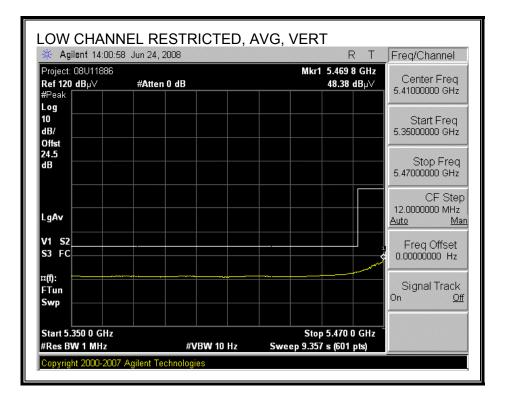
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8.3.7. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 5.6 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

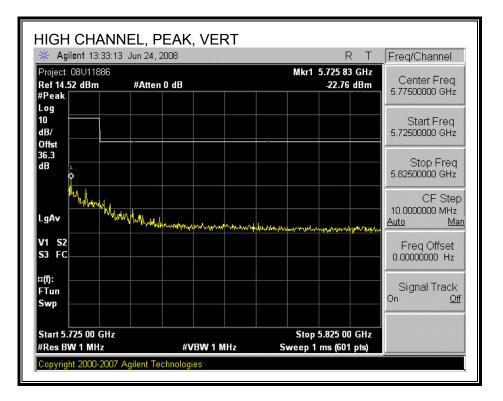


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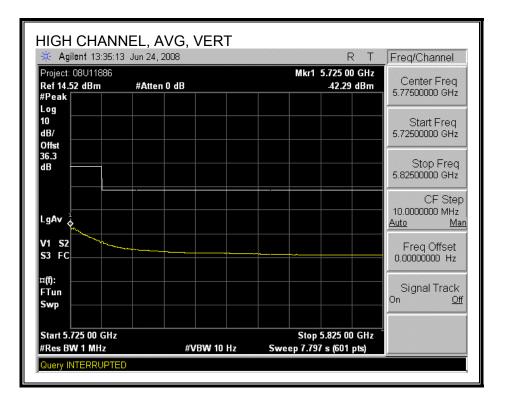


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AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)



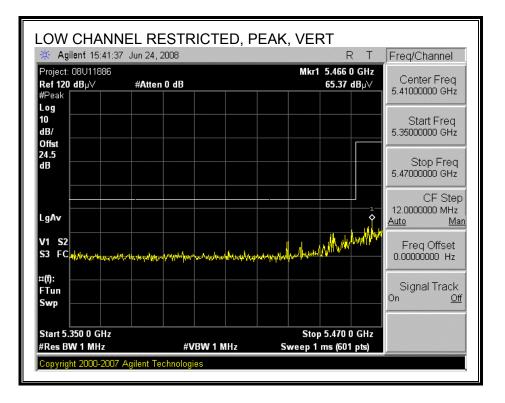
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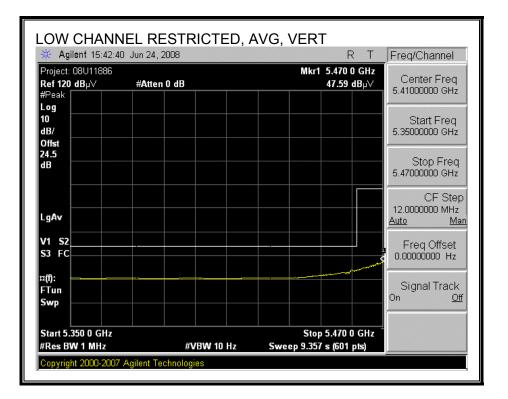
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8.3.8. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE 5.6 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

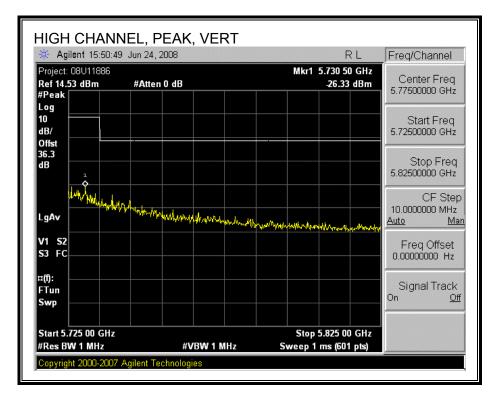


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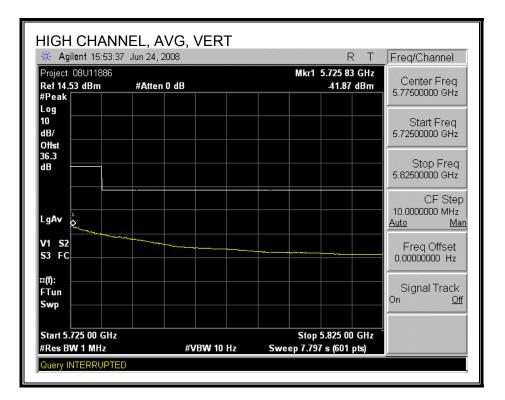


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AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)



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8.4. RECEIVER ABOVE 1 GHz WORST CASE

H Frequency Cables 3 foot cable 12 foot cable HPF Reject Filter Peak M RBW- Average RBW-1M f Dist Read Pk Read Avg. AF CL Amp D Corr Fltr Peak Avg Pk Lim Avg Lim Pk Mar Avg Mar dCh. 5300 MHz 0 4B/m dB dB dB 0.0 0.0 40.4 20.0 74 54 -33.6 -34.0 -34.0 -30.9 -36.0 0.0 0.0 45.0 25.1 74 54 -30.5 -30.9 -36.0 0.0 0.0 49.2 29.3 74 54 -24.8 -24.7 - 0 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 - 4127 ex Norther emissions wee detected above the system noise floor. Image: Sine wee field Strength I Avg Lim Average Field Strength I														ta ba	uipmen	st Eq
If Frequency Cables Image: Control of the system noise floor. f Measurement Frequency Amp Preamp Gain Avg Lim Avg Lim	Limit		GHz	orn > 180	Н	z	26-40GH	plifer	Pre-am	Hz	1-260	nplifer	Pre-an	_		
2 foot cable 3 foot cable 12 foot cable HPF Reject Filter Peak A RBW= Average RBW=1M f Dist Read Avg AF CL Amp D Corr Fltr Peak Avg Pk Lim Avg Lim Pk Mar Avg Mar f Dist Read Avg AF CL Amp D Corr Fltr Peak Avg Pk Lim Avg Mar Avg Mar dL (m) dBuV dBuV dBin dB dB dB dBuV/m dBuV/m dBuV/m dB dB <th>RX RSS 210</th> <th>•</th> <th></th> <th></th> <th></th> <th>•</th> <th></th> <th></th> <th></th> <th>)5(🗸</th> <th>008A00</th> <th>gilent 3</th> <th>• T145 A</th> <th>@3m</th> <th>/N: 2238</th> <th>60; 9</th>	RX RSS 210	•				•)5(🗸	008A00	gilent 3	• T145 A	@3m	/N: 2238	60; 9
f Dist Read Avg. AF CL Amp D Corr Flr Peak Avg Pk Lim Avg Lim Pk Mar Avg Mar Hz (m) dBuV dBm dB dB dB dBuV/m dBuV/m dBuV/m dBuV/m dBuV/m dBuV/m dB dB dB 1 Ch. 5300 MHz 0 30 50.5 30.1 25.9 0.0 -36.0 0.0 40.4 20.0 74 54 -33.6 -34.0 0 0 3.0 52.7 32.3 26.6 0.0 -35.8 0.0 0.0 43.5 23.1 74 54 -30.9 -36.9	<u>Measurements</u> =VBW=1MHz		ject Filte	Re	HPF		able	foot c	12		able	foot c	3			i Fre
Hz (m) dBuV dBnV dB/m dB dB dB dB dB dB dBuV/m dBuV/m dBuV/m dBuV/m dBuV/m dB dB dB 1 Ch. 5300 MHz 1	=VBW=1MHz e <u>Measurements</u> MHz ; VBW=10Hz	Avera		•			er 🗸	hambe	C-5m C	•			,			
0 3.0 50.5 30.1 25.9 0.0 -36.0 0.0 40.4 20.0 74 54 -33.6 -34.0 0 3.0 52.7 32.3 26.6 0.0 -35.8 0.0 0.0 43.5 23.1 74 54 -33.6 -34.0 0 3.0 54.2 34.2 26.7 0.0 -35.8 0.0 0.0 45.5 23.1 74 54 -30.9 -28.9 0 -28.9 0 -28.9 0 -28.9 0 -28.9 0 -28.9 0 -24.8 -24.7 -24.8 -24.7 -24.8 -24.7 -24.8 -24.7 -24.8 -24.7 -24.8 -24.7 -24.8 -24.7 -24.8 -24.7 -24.8 -24.7 -24.8 -24.7 -24.8 -24.7 -24.8 -24.7 -24.8 -24.7 -24.8 -24.7 -24.8 -24.8 -24.7 -24.8 -24.8 -24.7 -24.8 -24.8 -24.7 -24.8 -24.8 -24.7 -24.8 -24.8 -24.8 -24.8	Notes (V/H)	-		-		<u> </u>				•						
0 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 0 3.0 54.2 34.2 26.7 0.0 -35.8 0.0 0.0 45.0 25.1 74 54 -30.5 -30.9 0 3.0 55.4 35.6 28.8 0.0 -35.1 0.0 0.0 49.2 29.3 74 54 -24.8 -24.7 412.7 412.7 Voider emissions wee detected above the system noise floor. Amp Preamp Gain	н	34.0	.22.6	54	74	20.0	40.4	0.0		36.0	0.0	25.9	20 1			
1 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 All2.7 f Measurement Frequency Amp Preamp Gain Average Field Strength L	Н	- 30.9	-30.5	54	74	23.1	43.5	0.0	0.0	-35.8	0.0	26.6	32.3	52.7	3.0)
: No other emissions wee detected above the system noise floor. f Measurement Frequency Amp Preamp Gain Average Field Strength I	v v															
: No other emissions wee detected above the system noise floor. f Measurement Frequency Amp Preamp Gain Average Field Strength I																
f Measurement Frequency Amp Preamp Gain Avg Lim Average Field Strength L							h	I				4		1		
		Vold Strengt	Average F	Arra Lim				Tain	Dreamn (: No
Dist Distance to Antenna D Con Distance Concet to Dineters recam reacting outengui Lana		-	-	-		rs	t to 3 mete								-	
Read Analyzer Reading Avg Average Field Strength @ 3 m Avg Mar Margin vs. Average Limi		-														
AF Antenna Factor Peak Calculated Peak Field Strength Pk Mar Margin vs. Peak Limit		. Peak Limit	Margin vs	Pk Mar		ngth										
CL Cable Loss HPF High Pass Filter								s Filter	High Pas	HPF				Cable Loss	CL	

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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:: BUT/Antenna/Laptop Mode : : TX (Worst Case) Target: : FCC Class B Read Limit Over Freq Level Factor Level Line Limit Remark MHz dBuV dB dBuV/m dBuV/m dB 58.130 49.13 -19.63 29.51 40.00 -10.50 Peak 1 2 261.830 49.42 -13.66 35.76 46.00 -10.24 Peak 358.830 46.74 -11.00 35.74 46.00 -10.26 Peak 3 4 424.790 43.19 -9.22 33.97 46.00 -12.03 Peak 455.830 47.46 -8.53 38.93 46.00 -7.07 Peak 5 552.830 41.77 -6.32 35.45 46.00 -10.55 Peak 6

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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:: BUT/Antenna/Laptop
Mode : : TX ( Worst Case)
Target: : FCC Class B
```

		Read			Limit	Over	
	Freq	Level	Factor	Level	Line	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

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9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted I	.imit (dBuV)
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* 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

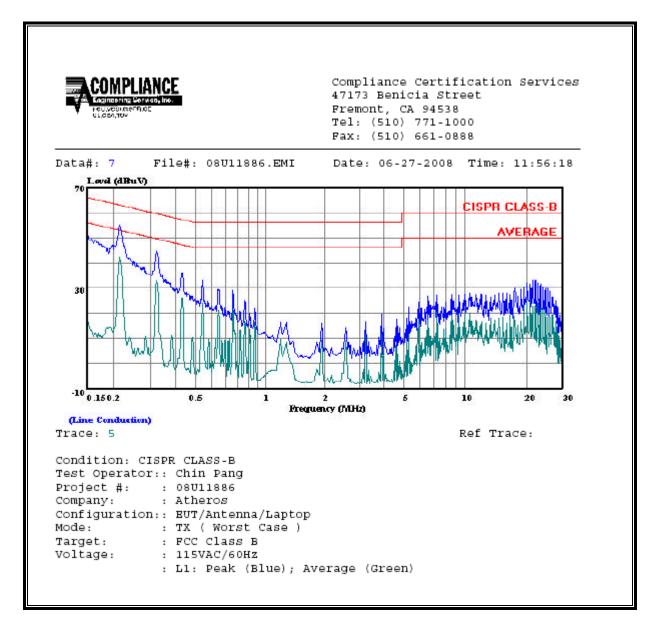
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<u>6 WORST EMISSIONS</u>

	CONDUCTED EMISSIONS DATA (115VAC 60Hz)								
Freq.		Reading		Closs	Limit	EN_B	Mar	gin	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 I	Data								

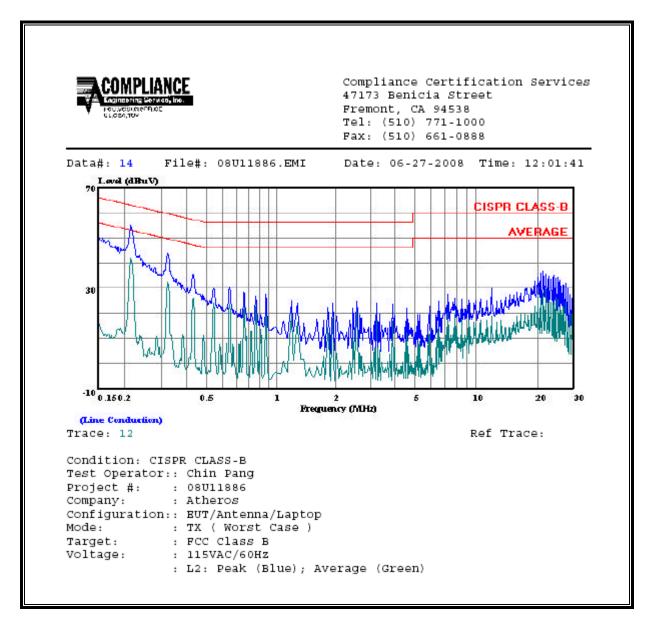
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LINE 1 RESULTS



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LINE 2 RESULTS



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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.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
(A) Lim	its for Occupational	l/Controlled Exposu	res	
0.3–3.0 3.0–30 30–300 300–1500 1500–100,000	614 1842/f 61.4	1.63 4.89/F 0.163	*(100) *(900/f²) 1.0 f/300 5	6 6 6 6
(B) Limits	for General Populati	on/Uncontrolled Exp	oosure	
0.3–1.34 1.34–30	614 824/f	1.63 2.19/f	*(100) *(180/f²)	30 30

TABLE 1-LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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/cm²)	Averaging time (minutes)
30–300 300–1500 1500–100,000	27.5	0.073	0.2 f/1500 1.0	30 30 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 occu-tions where a transient through a location where occu-

pational/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 ex-posed, 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.

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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 Ex-
posed 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 ²)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	280/f	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> ^{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 x 10 ⁻⁴ f ^{0.5}	6.67 x 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^2 is equivalent to 1 mW/cm^2 .
- A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

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CALCULATIONS

Given

and

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

where

E = Field Strength in Volts/meter

P = Power in Watts

 $S = E^{2}/3770$

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^2

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/cm² is converted to units of W/m² by multiplying by a factor of 10.

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LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm²

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m²

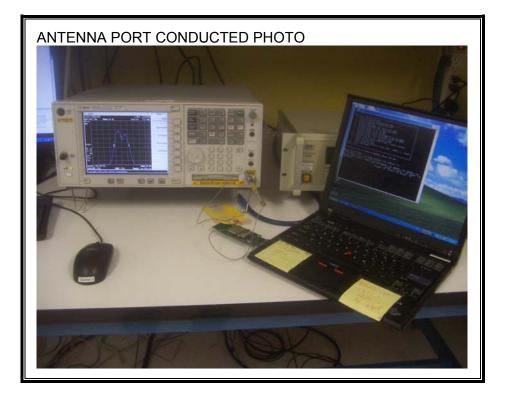
<u>RESULTS</u>

Mode	Band	MPE	Output	Antenna	FCC Power	IC Power
		Distance	Power	Gain	Density	Density
		(cm)	(dBm)	(dBi)	(mW/cm^2)	(W/m^2)
		(011)	((*=-)	((/

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11. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



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RADIATED RF MEASUREMENT SETUP



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POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP



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END OF REPORT

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