

FCC CFR47 PART 15 SUBPART E **CERTIFICATION TEST REPORT** FOR

WLAN a/b/g/n miniPCI Adapter MODEL NUMBER: 65-VF320-P2 FCC ID: J9C-65VF320P2

REPORT NUMBER: 07U11488-2 **ISSUE DATE: JANUARY 10, 2008**

Prepared for

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Prepared by

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	QUALCOMM INCORPORATED
	900 ARASTRADERO ROAD
	PALO ALTO, CA 94304, USA
EUT DESCRIPTION:	WLAN a/b/g/n miniPCI Adapter
MODEL:	65-VF320-P2
SERIAL NUMBER:	6043
DATE TESTED:	NOVEMBER 19 - DECEMBER 10, 2007

APPLICABLE STANDARDS				
STANDARD	TEST RESULTS			
CFR 47 Part 15 Subpart E	No Non-Compliance Noted			

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Tested By:

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Mautonpulm

THANH NGUYEN 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, FCC MO&O 06-96, 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
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a RoHS/4000 Series PCI-E mini-card for 2.4/5GHz Client applications. The radio module is manufactured by Qualcomm Inc.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range	Mode	Output Power	Output Power
(MHz)		(dBm)	(mW)
5180 - 5240	802.11a	13.69	23.39
5180 - 5240	802.11n HT20	12.88	19.41
5190 - 5230	802.11n HT40	15.55	35.89

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes three monopole antennas in MIMO Configuration, each with a maximum gain of 3 dBi for 5GHz bands.

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Qualcomm PTT rev. 4.0.11.51 The test utility software used during testing was PTTGUI, Version 11-14-2007.

5.5. WORST-CASE CONFIGURATION AND MODE

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

The worst-case data rate emissions tests were made in the 802.11a CDD mode @ 6Mbps, HT20 MCS07 @ 65Mbps, and HT40 MCS15 @ 135Mbps.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST						
Description	Manufacturer	Model	Serial Number	FCC ID		
Laptop	Dell	PP02X	CAP11290	DoC		
AC adapter	Dell	LA65NS0-00	72N-5925	DoC		
USB Mouse	Kensington	72123	25007290	DoC		
Extender Card	CalAmp	STCBMP13	626	N/A		

I/O CABLES

	I/O CABLE LIST						
Cable No.	Port	# of Identica	Connector Type	Cable Type	Cable Length	Remarks	
		Ports	51	31	þ		
1	AC	1	US 115V	Un-shielded	.8m	No	
2	DC	1	DC Plug	Un-shielded	1.5m	No	

TEST SETUP

The EUT is installed in extender card and a host laptop computer during the tests. Test software exercised the radio card.

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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
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	06/12/07	06/12/08
RF Filter Section	Agilent / HP	85420E	3705A00256	06/12/07	06/12/08
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	06/12/07	08/13/08
Preamplifier, 1300 MHz	Agilent / HP	8447D	1937A02062	05/09/07	05/09/08
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	US42510266	10/18/07	10/18/08
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	09/15/07	09/15/08
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00931	08/06/07	08/16/08
Power Sensor 10MHz - 18GHz	Agilent / HP	8481A	2237A31744	04/30/07	04/30/08
Peak Power Meter	Agilent / HP	E4416A	GB41291160	12/04/07	12/04/08
5.15-5.35 GHz Reject Filter	Micro-Tronics	BRC13190	1	CNR	CNR
5.725-5.825 GHz Reject Filter	Micro-Tronics	BRC13192	2	CNR	CNR
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	09/15/07	09/15/08
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	09/15/07	09/15/08
EMI Test Receiver	R & S	ESHS 20	827129/006	01/27/07	01/27/08

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7. ANTENNA PORT TEST RESULTS

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

7.1.1. 26 dB and 99% BANDWIDTH

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

RESULTS

Channel	Frequency	26 dB Bandwidth	99% Bandwidth	
	(MHz)	(MHz)	(MHz)	
Low	5180	18.834	16.3355	
Middle	5220	18.91	16.3932	
High	5240	18.819	16.3853	

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26 dB and 99% BANDWIDTH



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7.1.2. OUTPUT POWER

<u>LIMITS</u>

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

Antenna Gain	10 Log (# Tx Chains)	Effective Legacy Gain	
(dBi)	(dB)	(dBi)	
3	3.01	6.01	

For the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

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RESULTS

Limit

Channel	Frequency	Fixed	В	4 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5180	17	18.834	16.75	6.01	16.73
Mid	5220	17	18.91	16.77	6.01	16.75
High	5240	17	18.819	16.75	6.01	16.73

Individual Chain Results

Channel	Frequency	Chain 1	Chain 2	Total	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	10.70	10.66	13.69	16.73	-3.04
Mid	5220	9.89	9.74	12.83	16.75	-3.92
High	5240	10.32	10.03	13.19	16.73	-3.54

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CHAIN 1 OUTPUT POWER



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CHAIN 2 OUTPUT POWER



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7.1.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

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

Channel	Frequency	Chain 1	Chain 2	Total
		Power	Power	Power
	(MHz)	(dBm)	(dBm)	(dBm)
Low	5180	10.53	10.61	13.58
Middle	5220	10.00	9.99	13.01
High	5240	9.89	9.80	12.86

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7.1.4. PEAK POWER SPECTRAL DENSITY

<u>LIMITS</u>

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

Antenna Gain	10 Log (# Tx Chains)	Effective Legacy Gain
(dBi)	(dB)	(dBi)
3	3.01	6.01

For the 5.15-5.25 GHz band, the peak power spectral density shall not exceed 4 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is 6.01 dBi, therefore the limit is 3.99 dBm.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

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RESULTS

Channel	Frequency	Chain 1	Chain 2	Total	Limit	Margin
		PPSD	PPSD	PPSD		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	-0.002	0.262	3.14	3.99	-0.85

Channel	Frequency PPSD With Combiner		Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5180	3.72	3.99	-0.27
Middle	5220	2.98	3.99	-1.01
High	5240	3.05	3.99	-0.94

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CHAIN 1 POWER SPECTRAL DENSITY



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CHAIN 2 POWER SPECTRAL DENSITY



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POWER SPECTRAL DENSITY WITH COMBINER



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7.1.5. PEAK EXCURSION

<u>LIMITS</u>

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner.

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5180	11.69	13	-1.31
Middle	5220	11.99	13	-1.01
High	5240	10.34	13	-2.66

PEAK EXCURSION



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7.1.6. CONDUCTED SPURIOUS EMISSIONS

<u>LIMITS</u>

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm / MHz.

TEST PROCEDURE

Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

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CHAIN 1 SPURIOUS EMISSIONS



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CHAIN 2 SPURIOUS EMISSIONS



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SPURIOUS EMISSIONS WITH COMBINER



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7.2. 802.11n HT20 MODE IN THE LOWER 5.2 GHz BAND

7.2.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

RESULTS

Channel	Frequency	26 dB Bandwidth	99% Bandwidth
	(MHz)	(MHz)	(MHz)
Low	5180	19.116	17.6158
Middle	5220	19.518	17.4682
High	5240	19.21	17.4437

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26 dB and 99% BANDWIDTH



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7.2.2. OUTPUT POWER

<u>LIMITS</u>

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

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RESULTS

Limit

Channel	Frequency	Fixed	В	4 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5180	17	19.116	16.81	3.00	15.81
Mid	5220	17	19.518	16.90	3.00	16.89
High	5240	17	19.21	16.84	3.00	16.83

Individual Chain Results

Channel	Frequency	Chain 1	Chain 2	Total	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	9.89	9.84	12.88	15.81	-5.92
Mid	5220	9.57	9.71	12.65	16.89	-7.32
High	5240	9.61	9.70	12.67	16.83	-7.22

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CHAIN 1 OUTPUT POWER

OUTPUT POWER LOW CH, CHA	JIN 1		
🔆 Agilent 13:52:12 Dec 12, 2007	Т	E	W/Avg
Ch Freq 5.18 GHz Channel Power	Trig Free	Auto	Res BW 1.0 MHz <u>Man</u>
RBW 1.0 MHz Project: 07/11488		Auto	Video BW 3.0 MHz <u>Man</u>
Ref 30 dBm Atten 30 dB #Samp Log 10 dB/ Offst		<u>Auto</u>	VBW/RBV 1.00000 <u>Man</u> Average 100
11.5 dB Center 5.180 00 GHz #Res BW 1 MHz #VBW 3 MHz	Span 30 MHz Sweep 20 ms (601 pts)	Avg/\ Auto	/BW Type Pwr (RMS) • <u>Man</u>
Channel Power F	Power Spectral Density		
9.89 dBm /20.0000 MHz	-63.12 dBm/Hz		Span/RBW 106
L Copyright 2000-2006 Agilent Technologies		Auto	<u>Ivian</u>

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CHAIN 2 OUTPUT POWER

OUTPUT POWER LOW CH, CHAIN 2	
₩ Agilent 13:50:35 Dec 12, 2007 T	BW/Avg
Ch Freq 5.18 GHz Trig Free Channel Power	Res BW 1.0 MHz Auto <u>Man</u>
RBW 1.0 MHz Project: 07/011488	Video BW 3.0 MHz Auto <u>Man</u>
Ref 30 dBm Atten 30 dB #Samp	VBW/RBV 1.00000 Auto <u>Man</u>
dB/ Offst 11.5	Average 100 <u>On Off</u>
Center 5.180 00 GHz Span 30 MHz Span 30 MHz	Avg/VBW Type Pwr (RMS) • Auto <u>Man</u>
Channel Power Power Spectral Density	
9.84 dBm / 20.0000 MHz -63.17 dBm/Hz	Span/RBW 106 Auto Man
Copyright 2000-2006 Agilent Technologies	

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7.2.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

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

Channel	Frequency	Chain 1	Chain 2	Total
		Power	Power	Power
	(MHz)	(dBm)	(dBm)	(dBm)
Low	5180	10.02	10.15	13.10
Middle	5220	9.83	9.85	12.85
High	5240	9.80	9.70	12.76

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7.2.4. PEAK POWER SPECTRAL DENSITY

<u>LIMITS</u>

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the peak power spectral density shall not exceed 4 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is 6.01 dBi, therefore the limit is 3.99 dBm.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

<u>RESULTS</u>

Middle and High channels were measured with the combiner only, since doing so results in the worst-case compared to measuring either chain alone.

Channel	Frequency	Chain 1	Chain 2	Total	Limit	Margin
		PPSD	PPSD	PPSD		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	-0.424	-0.716	2.44	3.99	-1.55

Channel	Frequency	PPSD With Combiner	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5180	3.61	3.99	-0.38
Middle	5220	3.13	3.99	-0.86
High	5240	3.81	3.99	-0.18

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CHAIN 1 POWER SPECTRAL DENSITY



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CHAIN 2 POWER SPECTRAL DENSITY



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POWER SPECTRAL DENSITY WITH COMBINER



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7.2.5. PEAK EXCURSION

<u>LIMITS</u>

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner.

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5180	12.16	13	-0.84
Middle	5220	12.07	13	-0.93
High	5240	10.09	13	-2.91

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PEAK EXCURSION



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7.2.6. CONDUCTED SPURIOUS EMISSIONS

<u>LIMITS</u>

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm / MHz.

TEST PROCEDURE

Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

Middle and High channels were measured with the combiner only, since doing so results in the worst-case compared to measuring either chain alone.

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CHAIN 1 SPURIOUS EMISSIONS



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CHAIN 2 SPURIOUS EMISSIONS



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SPURIOUS EMISSIONS WITH COMBINER



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7.3. 802.11n HT40 MODE IN THE LOWER 5.2 GHz BAND

7.3.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

RESULTS

Channel	Frequency	26 dB Bandwidth	99% Bandwidth
	(MHz)	(MHz)	(MHz)
Low	5190	38.348	35.5714
High	5230	37.622	35.379

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26 dB and 99% BANDWIDTH



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7.3.2. OUTPUT POWER

<u>LIMITS</u>

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

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RESULTS

Limit

Channel	Frequency	Fixed	В	4 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5190	17	38.348	19.84	3.00	16.99
High	5230	17	37.622	19.75	3.00	16.99

Individual Chain Results

Channel	Frequency	Chain 1	Chain 2	Total	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5190	12.42	12.65	15.55	16.99	-4.57
High	5230	12.22	12.42	15.33	16.99	-4.77

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CHAIN 1 OUTPUT POWER



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CHAIN 2 OUTPUT POWER



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7.3.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

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

Channel	Frequency	Chain 1	Chain 2	Total
		Power	Power	Power
	(MHz)	(dBm)	(dBm)	(dBm)
Low	5190	11.94	12.01	14.99
High	5230	12.05	12.22	15.15

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7.3.4. PEAK POWER SPECTRAL DENSITY

<u>LIMITS</u>

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the peak power spectral density shall not exceed 4 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is 6.01 dBi, therefore the limit is 3.99 dBm.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

High channels were measured with the combiner only, since doing so results in the worst-case compared to measuring either chain alone.

Channel	Frequency	Chain 1	Chain 2	Total	Limit	Margin
		PPSD	PPSD	PPSD		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5190	-1.063	-1.374	1.79	3.99	-2.20

Channel	Frequency	PPSD With Combiner	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5190	2.44	3.99	-1.55
Middle	5230	2.49	3.99	-1.50

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CHAIN 1 POWER SPECTRAL DENSITY

PSD LOW CH, CHAIN 1



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CHAIN 2 POWER SPECTRAL DENSITY

PSD LOW CH, CHAIN 2



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POWER SPECTRAL DENSITY WITH COMBINER

PSD LOW CH, WITH COMBINER



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PSD HIGH CH, WITH COMBINER



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7.3.5. PEAK EXCURSION

<u>LIMITS</u>

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner.

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5190	12.91	13	-0.09
High	5230	10.57	13	-2.43

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PEAK EXCURSION



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7.3.6. CONDUCTED SPURIOUS EMISSIONS

<u>LIMITS</u>

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm / MHz.

TEST PROCEDURE

Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

High channels were measured with the combiner only, since doing so results in the worst-case compared to measuring either chain alone.

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CHAIN 1 SPURIOUS EMISSIONS



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CHAIN 2 SPURIOUS EMISSIONS



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SPURIOUS EMISSIONS WITH COMBINER



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8. RADIATED TEST RESULTS

<u>LIMITS</u>

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range	Field Strength Limit	Field Strength Limit
(MHz)	(uV/m) at 3 m	(dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

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

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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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8.1. TRANSMITTER ABOVE 1 GHz

8.1.1. TRANSMITTER ABOVE 1 GHz FOR 802.11a DUAL CHAIN LEGACY MODE IN THE LOWER 5.2 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

Agilent 09:13:4	7 Nov 19, 2007	R T	Freq/Channel
'roject: 07U11488 t ef 100 dB µ∨ Peak	#Atten 0 dB	Mkr1 5.032 00 GHz 58.48 dBµ∨	Center Freq 5.07500000 GHz
og 0 B/			Start Freq 5.00000000 GHz
I.3 B I	1 1		Stop Freq 5.15000000 GHz
4.0 Βμ∨ <mark>Μαναναλαβάηλ</mark> gAv	dere Schehltreitensen versoneren der	her Nedersandersandersandersandersandersandersandersandersandersandersandersandersandersandersandersandersander	CF Step 15.0000000 MHz <u>Auto Ma</u>
1 S2 3 FC			Freq Offset 0.00000000 Hz
(ք)։ Tun wp			Signal Track On <u>Of</u>
tart 5.000 00 GHz		Stop 5.150 00 GHz	

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RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

Agilent 09:08:5	4 Nov 19, 2007			RT	Freq/Channel
Project: 07U11488 tef 100 dB µV Peak	#Atten 0 dB		Mkr1 5	i.139 00 GHz 58.63 dBµ∀	Center Freq 5.07500000 GHz
og 0 IB/					Start Freq 5.0000000 GHz
1.3 B					Stop Freq 5.1500000 GHz
4.0 Иллиплиун⁄ Вµ√ И <mark>ллиплиун⁄н</mark> gAv	telleminninghillheimi	phintensiliteristation	ally officers and a second	Mannadorvaha	CF Ste 15.000000 MHz <u>Auto M</u>
1 S2 3 FC					Freq Offset 0.00000000 Hz
(f): Tun wp					Signal Track On <u>O</u>
tart 5.000 00 GHz		VBW 1 MHz	Stop 5	.150 00 GHz	

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AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

See upper 5.2GHz band report, no conduct spurious emissions were detected at range 5250MHz to 5350Mhz

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HARMONICS AND SPURIOUS EMISSIONS

	High	Frequency	Measurem	ent											
omplia	ance Ce	rtification §	Services, Fr	emont	5m Ch	amber									
omeet	w Ouel	Com INC													
roject	#: 07U	11488													
ate: 1	1/19/200	07													
est En onfigu	gineer: ration: l	Thanh Ngu FUT Ext (iyen Card Lantor												
lode: '	Transmi	it 5.2 GHz L	ower Band	P .											
est Eq	uipmen	<u>t:</u>													
н	orn 1-	18GHz	Pre-ar	nplifer	1-260	GHz	Pre-am	plifer	26-40GH	z	Н	orn > 18	GHz		Limit
173: 9	S/N: 6717	7@3m	- T144 M	litea 30	08A009	31 _								-	FCC 15.209
, .														•	
Hi Fred	juency Cal	oles	1												
	2 foot	cable	3	foot	able		12	foot c	able		HPF	Re	eject Filter	Peak	<u>Measurements</u> W=VBW=1MHz
							A-5m C	hamb	er			_ P	002	Avera	ge Measurements
						•			•			<u> </u>		RBW=	1MHz; VBW=10Hz
ſ	D: -	D 1 DI	Deed 4	AT	CT	Δ.	DC	174	D. 1		. т.	A T .	DI. 1. 7	A	NT ·
1 GH7	Dist (m)	Read Pk dBnV	Read Avg. dBuV	AF dB/m	L CL	Amp dP	D Corr dB	Fitr dR	Peak dBuV/m	Avg dBuV/r~	Pk Lim dBrV/w	Avg Lim dBrV/~	rk Mar dB	Avg Mar dP	Notes (V/H)
3112 a1100	ics emi	ssions	ωuv	unu un	uD.	യ	<u>ш</u>	<u> </u>	an a	and a vint		abuvun	ω.	<u>w</u>	(1/11)
w Ch 5	180MHz														
360	3.0	37.7	24.5	37.0	10.4	-36.8	0.0	0.0	48.3	35.1	74	54	-25.7	-18.9	V Naiza Flaar
.540 .360	3.0	38.1 37.1	25.0	38.1	12.7	-34.8 -36.8	0.0 0.0	0.0 0.0	54.U 47.7	40.9 34.7	74 74	54 54	-20.0	-13.1 -19.3	H
.540	3.0	37 <i>9</i>	24.5	38.1	12.7	-34.8	0.0	0.0	53.8	40.4	74	54	-20.2	-13.6	Noise Floor
d Ch 5 405	220MHz 3.0	36.9	23.5	37.0	10.5	-36.8	۱IJ	٦U	47.6	34.2	74	54	-26.4	-19.8	н
.613	3.0	36.9	24.2	37.9	12.7	-34.8	0.0	0.0	52.7	40.0	74	54	-21.3	-14.0	Noise Floor
405	3.0	37.6 37.1	24.2	37.0	10.5	-36.8	0.0	0.0	48.3	34.9	74	54 54	-25.7	-19.1	V Noise Floor
gh Ch :	5240MH			313	14.1	-2740	0.0	0.0	343	704		-/4		-100	110150 11001
480	3.0	37.2	24.1	37.0	10.6	-36.7	0.0	0.0	48.1	35.0	74	54 54	-25.9	-19.0	V Noise Fleer
.720	3.0	37.1 36.8	24.0	37.0	12.8	-34./ -36.7	0.0 0.0	0.0 0.0	52.8 47.7	40.3	74 74	24 54	-21.2	-13./ -19.3	H
.720	3.0	37.5	24.7	37.6	12.8	-34.7	0.0	0.0	53.2	40.4	74	54	-20.8	-13.6	Noise Floor
urious 105	Emission 3.0	is 54.3	36.8	23.8	3.0	-39.5	0.0	0.0	41.6	24.1	74	54	-32.4	-29.9	Н
250	3.0	49.7	34.1	24.7	33	-39.1	0.0	0.0	38.6	23.0	74	54	-35 <i>A</i>	-31.0	H
)10)66	3.0	56.1 52.5	38.8	23.8	3.0 4.4	-39.5 -39.0	0.0	0.0	43.5	26.1 20.7	74	54 54	-30.5	-27.9	V
other	emission	s were detecte	d above noise	fleer		-300	0.0	0.0	TUA		/*		-2730		r
		l									l			l	
v. 4.12.	7														
	f	Measureme	nt Frequenci			Amn	Preamn (Tain				Ava Tim	åverage F	ield Strengt	h Timit
	Dist	Distance to	Antenna	,		D Corr	Distance	Corre	ct to 3 mete	ers		Pk Lim	Peak Field	Strength L	imit
	Read	Analyzer R	eading			Avg	Average	Field S	Strength @	3 m		Avg Mar	Margin vs.	Average L	imit
	AF	Antenna Fa	ictor			Peak	Calculate	d Peal	c Field Stre	ngth		Pk Mar	 Margin vs.	Peak Limit	
	CL	Cable Loss				H₽F	High Pas	s Filter							

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

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



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RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

🔆 Agilent 10:12:5	4 Nov 26, 2007			RT	Freq/Channel
Project: 07U11488 Ref 100 dB µ∨	#Atten 0 dB		Mkr1 5.118 57.5	50 GHz 5 dBµ∨	Center Freq 5.07500000 GHz
- og 10 1B/					Start Freq 5.0000000 GHz
)1.4 IB)1					Stop Freq 5.1500000 GHz
13.0 1Βμ∨ φ^γγλγωνηγγγγλη _gAv	water with the part	harrouthous development of	urdennen opensom og forstennen og forstennen og forstennen og forstennen og forstennen og forstennen og forsten I som en som e	hadeere date with the second	CF Step 15.0000000 MHz <u>Auto Ma</u>
/1 S2 S3 FC					Freq Offset 0.00000000 Hz
((): Tun ℘					Signal Track On <u>O</u> i
Start 5.000 00 GHz	#	/BW 1 MHz	Stop 5.150 Sweep 1 ms /6	00 GHz 01 pts)	

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AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

See upper 5.2GHz band report, no conduct spurious emissions were detected at range 5250MHz to 5350Mhz

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HARMONICS AND SPURIOUS EMISSIONS

omation	High	Frequency	Measuren Sourison E	nent	5m ("h	amhar									
ompli	ance Ce	runcation	services, Fi	remont	əm Ch	amber									
ompai	ny: Qual # 077	Com INC.													
oject ite: 1	#: 070. 1/21/200	11488 17													
st En	ngineer:	Thanh Ngu	iyen												
onfigu odo: 1	uation: 1 Transmi	EUT, Ext. (tard, Laptoj 1720 modo	þ											
est Eq	juipmen	t:	1120 moue												
н	lorn 1-	18GHz	Pre-a	mplifer	1-260	GHz	Pre-am	plifer	26-40GH	z	H	orn > 18	GHz		Limit
173: 9	S/N: 6717	/ @3m	- T144	Mitea 30	084009	31 _				<u> </u>				_	FCC 15.209
						•				<u> </u>				<u> </u>	
Hi Fre	quency Cal	bles						_							
	2 foot	cable	;	3 foot o	able		12	footo	able		HPF	Re	eject Filte	r Peal	<u>k Measurements</u> W=VBW=1MHz
							A-5m C	hamb	er 🔔	HP	F_7.6GHz	,		Avera	ge Measurements
											-			RBW=	1MHz; VBW=10Hz
f	Dist	Read Pk	Read Avo	AF	CI.	Amp	D Corr	Fltr	Peak	Ανσ	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)
armor	nics emi	ssions													
w Ch 5	3180MHz	28.6	25.4	27.0	10.4	26.9	0.0	0.6	50.0	26.9	74	54	24.0	17.2	v
540	3.0	38.7	25.4 25.3	38.1	10.4	-34.8	0.0 0.0	0.7	55.3	42.0	74	54 54	-24.0 -18.7	-17.2	Noise Floor
360	3.0	37.2	24.3	37.0	10.4	-36.8	0.0	0.8	48.6	35.7	74	54	-25.4	-18.3	H
540 d Ch 5	220MHz	38.4	25.2	38.1	12.7	-34.8		0.7	551	41.9	74	54	-19,0	-12.1	Noise Floor
.440	3.0	35.7	23.9	37.0	10.5	-36.7	0.0	0.8	47.3	35.5	74	54	-26.7	-18.5	H
.660 .440	3.0	37.1 37.6	23.4 24.7	37.8	12.7	-34.7 -36.7	0.0	0.7	53.6 49.2	39.9 36.3	74 74	54 54	-20.4	-14.1 -17.7	Noise Floor V
.660	3.0	38.2	25.3	37.8	12.7	-34.7	0.0	0.7	54.7	41.8	74	54	-19.3	-12.2	Noise Floor
gh Ch: 480	5240MHz	37 4	24.1	37.0	10.6	367	0.0	0.8	40.1	35.8	74	54	-24.9	-18.2	v
.720	3.0	41.0	28.5	37.6	12.8	-34.7	0.0	0.7	57.5	44.9	74	54	-16.5	-9.1	v
.480	3.0	36.6	23.5	37.0	10.6	-36.7	0.0	0.8	48.3	35.1	74	54	-25.7	-18.9	H Naiza Flaari
other	emission	30.5 swere detect	ed above noise	fleer	12.0	-34./	0.0	0./	54./	41.0	/4	24	-195	-12.4	INDISC FIDOF
					<u> </u>		l	<u> </u>				l	l		
v. 4.12.	.7														
	f	Measureme	ent Frequenc	v		Amp	Preamo	Gain				Avg Lim	Average H	ield Strengt	h Limit
	Dist	Distance to	Antenna	-		D Corr	Distance	Corre	ct to 3 mete	ers		Pk Lim	Peak Field	i Strength L	imit
	Read	Analyzer R	eading			Avg	Average	Field S	Strength @	3 m		Avg Mar	Margin vs	Average L	imit
	AF	Antenna Fa	actor			Peak	Calculate	d Peal	k Field Stre	ngth		Pk Mar	Margin vs	Peak Limit	:
	CL	Cable Loss	;			HPF	Hıgh Pas	s Filter							

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

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



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RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

🔆 Agilent 13:36:3	2 Nov 26, 2007			RT	Freq/Channel
Project: 07U11488 Ref 100 dB µ∨ #Peak	#Atten 0 dB		Mkr1 5.137 56.5	50 GHz 52 dBµ∨	Center Freq 5.07500000 GHz
Log 10 1B/ Offet					Start Freq 5.0000000 GHz
31.4 1B DI				1	Stop Freq 5.1500000 GHz
14.0 1Β μ∨ <mark>ιι∿Μνωφηνιάμω</mark> _gAv	mendradiantitati	have were may block of f	nterenter and the second	wa Inaka w	CF Stej 15.000000 MHz <u>Auto M</u> a
/1 S2 33 FC					Freq Offset 0.00000000 Hz
«(f): =Tun Swp					Signal Track On <u>O</u>
Start 5.000 00 GHz		/BW/1 MHz	Stop 5.150	00 GHz	

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AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

See upper 5.2GHz band report, no conduct spurious emissions were detected at range 5250MHz to 5350Mhz

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HARMONICS AND SPURIOUS EMISSIONS

Companie Corfficience Certification Services, premont Sn Chamber Companie Contraction Services, premont Sn Chamber Comparison: QualCon INC: Project #: 01262007 Test Engineer: Thanh Ngwn Configuration: EUT, Ext. Card, Laptop. Mode: Transmit 5.2GHz_HT40 Test Equipment: Horn 1-18GHz Pre-amplifer 1-26GHz Pre-amplifer 26-40GHz Filter Contraction Co	т.	High I	requency	Measuren	nent .	5 (7)	,									
ompany: QualCom INC: roject #: 07101488 est Engineer: Thank Ngwen onfiguration: EVT, Ext. Card, Laptop. food: Transmit 5.2 GHz_HT40 est Equipment: Horn 1.18GHz Pre-amplifer 1.26GHz Horn > 18GHz Limit FCC 15.209 til Pre-amplifer 1.26GHz Pre-amplifer 26-40GHz Horn > 18GHz Limit FCC 15.209 til Prequency Cables Total and avg AF CL Pre-amplifer 26-40GHz HPFF Reject Filter Peak Meanurement RBW=10Hz VBW=VBW=10H Marca cable 12 foot cable Implifer 26-40GHz HPFF Reject Filter Peak Meanurement RBW=10Hz VBW=10H Marca cable 12 foot cable Implifer 26-40GHz HPFF Reject Filter Peak Meanurement RBW=10Hz VBW=10H Marca cable 12 foot cable Implifer 26-40GHz HPF Reject Filter Neatwordshalt 10 foot cable <th< th=""><th>phane</th><th>e Cer</th><th>tification i</th><th>Services, Fi</th><th>emont</th><th>5m Ch</th><th>amber</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></th<>	phane	e Cer	tification i	Services, Fi	emont	5m Ch	amber									
Set: 12/2/2007 set: Equipment: Horn 1-18GHz Pre-amplifer 1-26GHz Horn > 18GHz Limit Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2" Tot colspan="2" Tot colspan="2" Pre-amplifer 26-40GHz Horn > 18GHz Limit Colspan="2" Colspan="2" Colspan="2" Colspan="2" Colspan="2" Colspan="2" Colspan="2" Limit Tot colspan= 3 3 foot colspan= 3 Are CL Amp D Corr Pin Peak Avg Pit Lim Avg Lim Avg Mar Noter Colspan= 3 <	pany: ect #	Qual 07111	Com INC. 1488													
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Horn 1-18GHz Pre-amplifer Pre-amplifer 26-0GHz Horn > 18GHz Limit T73; S/R: 6717 @3m T144 Miteq 3008A00931 Image: Constraint of the second se	Equip	ment:	_												1	
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H Frequency Cables 12 foot cable HPF Reject Filter Peak Measuremer RBW=VBW=IMH 1 12 foot cable HPF Reject Filter Peak Measuremer RBW=VBW=IMH f Dist Read Avg AF CL Amp D Corr Fltr Peak Avg Im Measuremer RBW=IMHz; VBW= f Dist Read Avg AF CL Amp D Corr Fltr Peak Avg Pk Lin Avg Im Avg Mar Notes GHz (m) dBu V dB dB dB dB uV/m dBuV/m dBuV/m dBuV/m dB uV/m MBuV/m Mar Avg Mar Notes sign 30 32 24.7 37.0 10.5 36.8 0.0 0.7 54.8 41.5 74 54 -25.6 -18.3 H sign 30 36.9 24.7 38.0 0.0 0.7 54.4 41.3 74 54 <td>'3; S/N:</td> <td>6717</td> <td>@3m</td> <td>▼ T144 I</td> <td>Miteq 30</td> <td>08A009</td> <td>931 🗸</td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td>•</td> <td>FCC 15.209</td>	'3; S/N:	6717	@3m	▼ T144 I	Miteq 30	08A009	931 🗸				-				•	FCC 15.209
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Image: Construction of the system o	2 f	oot c	able	3	3 foot o	able		12	root d	able		HPF	Re	eject Filte	er <u>Peal</u> RB	<u>wieasurements</u> W=VBW=1MHz
f Dist Read Pk Read Avg. AF CL Amp D Corr Flr Peak Avg Pk Lim Avg Mar Avg Mar Notes GHz (m) dBvV dBvV dBvV dB dB dB dB dB dB dBvV/m dBuV/m dBuV dBuV dBuV <th></th> <th></th> <th></th> <th>•</th> <th></th> <th></th> <th>•</th> <th>A-5m C</th> <th>hamb</th> <th>er 🔽</th> <th>HP</th> <th>F_7.6GHz</th> <th>•</th> <th></th> <th>Avera RBW=</th> <th>ge <u>Measurements</u> 1MHz ; VBW=10Hz</th>				•			•	A-5m C	hamb	er 🔽	HP	F_7.6GHz	•		Avera RBW=	ge <u>Measurements</u> 1MHz ; VBW=10Hz
GHz (m) dBuV dBuV dBuV dBuV dBuV/m <	I	Dist	Read Pk	Read Avg.	AF	CL	Amp	D Corr	Fltr	Peak	Avg	Pk Lim	Avg Lim	Pk Mar	Avg Mar	Notes
is jookhiz	tz (nopics	(m) emis	dBuV sions	dBuV	dB/m	dB	dB	dB	đB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)
Sou Sol Sol <td>90MHz</td> <td>20</td> <td>27.5</td> <td>24.7</td> <td>27.0</td> <td>10.5</td> <td>26.0</td> <td>0.0</td> <td>0.0</td> <td>40.0</td> <td>26.1</td> <td>71</td> <td>£ 4</td> <td>25.1</td> <td>17.0</td> <td>17</td>	90MHz	20	27.5	24.7	27.0	10.5	26.0	0.0	0.0	40.0	26.1	71	£ 4	25.1	17.0	17
380 30 369 24.2 370 10.5 368 0.0 0.8 48.4 35.7 74 54 -25.6 -18.3 H 570 30 37.8 24.7 380 12.7 -34.8 0.0 0.7 54.4 41.3 74 54 -19.6 -12.7 Noise Flat 600 3.0 37.4 24.4 37.0 10.5 -36.7 0.0 0.8 49.1 36.0 74 54 -19.6 -12.7 Noise Flat 690 3.0 37.7 24.5 37.7 12.7 34.7 0.0 0.7 54.1 41.0 74 54 -19.9 -13.0 Noise Flat 640 3.0 37.7 24.5 37.7 12.7 -34.7 0.0 0.7 54.1 41.0 74 54 -24.9 -17.3 V 690 3.0 37.9 24.7 37.7 12.7 -34.7 0.0 0.7 54.3 41.1 74 54 -19.7 -12.9 Noise Fla 60	0	3.0 3.0	315	24./ 24.9	37.0	10.5	-30.8 -34.8	0.0 0.0	0.5	48.9 54.8	30.1 41.5	/4 74	54 54	-25.1 -19.2	-17.9 -12.5	v Noise Floor
5230MHz In In </td <td>0</td> <td>3.0 3.0</td> <td>36.9 37.8</td> <td>24.2 24.7</td> <td>37.0 38.0</td> <td>10.5 12.7</td> <td>-36.8 -34.8</td> <td>0.0 0.0</td> <td>0.8</td> <td>48.4 54.4</td> <td>35.7 41-3</td> <td>74 74</td> <td>54 54</td> <td>-25.6</td> <td>-18.3 -12.7</td> <td>H Naise Floor</td>	0	3.0 3.0	36.9 37.8	24.2 24.7	37.0 38.0	10.5 12.7	-36.8 -34.8	0.0 0.0	0.8	48.4 54.4	35.7 41-3	74 74	54 54	-25.6	-18.3 -12.7	H Naise Floor
460 3.0 37.4 24.4 37.0 10.5 -36.7 0.0 0.8 49.1 36.0 74 54 -24.9 -18.0 H 690 3.0 37.7 24.5 37.7 12.7 -34.7 0.0 0.7 54.1 41.0 74 54 -19.9 -13.0 Noise Fia 600 3.0 37.5 25.1 37.0 10.5 -36.7 0.0 0.7 54.1 41.0 74 54 -24.9 -17.3 V 690 3.0 37.9 24.7 37.7 12.7 -34.7 0.0 0.7 54.3 41.1 74 54 -24.9 -17.3 V 690 3.0 37.9 24.7 37.7 12.7 -34.7 0.0 0.7 54.3 41.1 74 54 -19.7 -12.9 Noise Fia 6 other emissions were detected above noise floor - - - - - - - - - - - - - - - -	230MHz		3743	47./	2020			0.0	0./		71-2	/-		-1985	-14-1	100150 1 1001
460 3.0 37.5 25.1 37.0 10.5 36.7 0.0 0.8 49.1 36.7 74 54 -24.9 -17.3 V .690 3.0 37.9 24.7 37.7 12.7 -34.7 0.0 0.7 54.3 41.1 74 54 -24.9 -17.3 V .690 3.0 37.9 24.7 37.7 12.7 -34.7 0.0 0.7 54.3 41.1 74 54 -19.7 -12.9 Noise Fla other emissions were detected above noise floor 0 0 0.7 54.3 41.1 74 54 -19.7 -12.9 Noise Fla v. 4.12.7	0:	3.0 3.0	37.4 37.7	24.4 24.5	37.0	10.5	-36.7 -34.7	0.0 0.0	0.8 0.7	49.1 54.1	36.0 4] J	74 74	54 54	-24.9 -19.9	-18.0 -13.0	H Noise Floor
690 3.0 37.9 24.7 37.7 12.7 -34.7 0.0 0.7 54.3 41.1 74 54 -19.7 -12.9 Noise Fla other emissions were detected above noise floor	0	3.0	37.5	25.1	37.0	10.5	-36.7	0.0	0.8	49.1	36.7	74	54	-24.9	-17.3	v
r. 4.12.7 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	0 :	3.0 ssieve	37.9 were detect	24.7 ed above poice	37.7 fleer	12.7	-34.7	0.0	0.7	54.3	41.1	74	54	-19.7	-12.9	Noise Floor
r. 4.12.7 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 D D D D D D D D D D D D D D D D D D D		3310115								l						
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	4.12.7															
Dist Distance to Antenna D Corr Distance Correct to 3 meters Pk Lim Peak Field Strength Limit	f	1	Measureme	ent Frequenc	у		Amp	Preamp (Gain				Avg Lim	Average I	Field Strengt	h Limit
Kead Analyzer Keading Average Ling Average Hield Strength (4) 5 m Average Margin Volar Margin Volar Average Lingt	Di Ra	ist] ead :	Jistance to Analyzer R	Antenna eading			D Corr	Distance	Corre Field (ct to 3 mete Strength @	ers 3 m		Pk Lm Ava Mor	Peak Fiel Margin ve	d Strength L Average T	umit imit
AF Antenna Factor Peak Calculated Peak Field Strength Pk Mar Margin vs. Peak Limit	A	F I	Antenna Fa	actor			Peak	Calculate	d Peal	k Field Stre	ngth		Pk Mar	Margin vs	. Peak Limit	
CL Cable Loss HPF High Pass Filter	~	LO	Cable Loss	;			HPF	High Pas	s Filter	:	-			0		

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8.2. WORST-CASE BELOW 1 GHz

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



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Read Limit Over Freq Level Level Factor Line Limit Rem MHz dBuV dBuV/m dB dBuV/m dB	
	lark
1 208.480 58.20 39.78 -18.42 43.50 -3.72 Pea 2 247.280 59.25 41.31 -17.94 46.00 -4.69 Pea 3 436.430 48.75 36.13 -12.62 46.00 -9.87 Pea 4 487.840 49.79 38.36 -11.43 46.00 -7.64 Pea 5 727.430 41.35 33.36 -8.00 46.00 -12.65 Pea 6 848.680 39.65 33.55 -6.10 46.00 -12.45 Pea	k k k k k

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



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VERT	ICAL DATA						
		Read	_		Limit	Over	
	Freq	Level	Level	Factor	Line	Limit	Remark
	MHz	dBuV	dBuv/m	db	dBuv/m	db	
ı	55.220	54.19	31.35	-22.83	40.00	-8.65	Peak
2	148.340	48.91	31.68	-17.23	43.50	-11.82	Peak
3	247.280	48.98	31.04	-17.94	46.00	-14.96	Peak
4	487.840	51.13	39.70	-11.43	46.00	-6.30	Peak
5	609.090	45.82	36.07	-9.75	46.00	-9.93	Peak
6	841.890	45.93	39.84	-6.09	46.00	-6.16	реак

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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 Limit (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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6 WORST EMISSIONS

	CONDUCTED EMISSIONS DATA (115VAC 60Hz)												
Freq.			Closs	Limit	EN_B	Marg	çin .	Remark					
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV(dB)	L1/L2				
0.16	55.92		41.08	0.00	65.52	55.52	-9.60	-14.44	L1				
3.44	41.96		27.22	0.00	56.00	46.00	-14.04	-18.78	L1				
3.82	47.72		34.06	0.00	56.00	46.00	-8.28	-11.94	L1				
0.17	54.56		37.74	0.00	65.21	55.21	-10.65	-17.47	L2				
3.38	41.60		28.66	0.00	56.00	46.00	-14.40	-17.34	L2				
3.82	43.32		26.95	0.00	56.00	46.00	-12.68	-19.05	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	I/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 <i>.89/</i> f 0.163	*(100) *(900/f²) 1.0 f/300 5	6 6 6 6
(B) Limits	for General Populati	ion/Uncontrolled Exp	posure	
0.3–1.34 1.34–30	614 824 <i>/</i> f	1.63 2.19/f	*(100) *(180/f ²)	30 30

TABLE 1-LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

I ABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Conti	nued
--------------------------------------------------------------	------

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	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-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.

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^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

RESULTS

Mode	Frequency	MPE	Output	Antenna	FCC Power
	Range	Distance	Power	Gain	Density
	(MHz)	(cm)	(dBm)	(dBi)	(mW/cm^2)
802.11a	5180 - 5240	20.0	13.69	3.00	0.01
802.11n HT20	5180 - 5240	20.0	12.88	3.00	0.01
802.11n HT40	5190 - 5230	20.0	15.55	3.00	0.01

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

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