

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

FOR 802.11ag/Draft 802.11n WLAN PCI-E Mini Card

> MODEL NUMBER: BCM94322MC FCC ID: QDS-BRCM1036 IC: 4324A-BRCM1036

> REPORT NUMBER: 07U11529-2A

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Prepared for BROADCOM CORPORATION 190 MATHILDA PLACE SUNNYVALE, CA 94086, USA

Prepared by

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Rev.	lssue Date	Revisions	Revised By
	1-26-08	Initial Issue	Hsin Fu Shih
А	2-7-08	Corrected some typos. changed frequency from 5690 to 5670 MHz.	Hsin Fu Shih

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1. ATTESTATION OF TEST RESULTS

	STANDARD	TEST RESULTS
	APPLICABLE STANDARDS	
DATE TESTED:	DECEMBER 09 to JANUARY 23, 2	2008
SERIAL NUMBER:	P208_S/N 194	
MODEL:	BCM94322MC	
EUT DESCRIPTION:	802.11ag / Draft 802n WLAN PCI-	E MINI CARD
COMPANY NAME:	BROADCOM CORPORATION 190 MATHILDA PLACE SUNNYVALE, CA 94086, USA	

CFR 47 Part 15 Subpart ENo Non-Compliance NotedRSS-210 Issue 7 Annex 9 and RSS-GEN Issue 2No 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:

Hsin-Fr. Shih

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VIEN TRAN 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
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 802.11ag/Draft 802.11n Wireless LAN transceiver card and manufactured by Broadcom. Model number is BCM94322MC.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

5150 to 5250 M	Hz Authorized Band						
Frequency Range (MHz)	Frequency Range (MHz) Mode		Peak Power Chain 1 (dBm)	Total Peak Power (dBm)	Output Power (mW)		
5180 - 5240	802.11a Legacy	N/A	N/A	14.33	27.10		
5180 - 5240	802.11n 20MHz SISO	covered by the	worst case 802.	11a Legacy test	ing		
5190 - 5230	802.11n 40MHz SISO	N/A	N/A	N/A	N/A		
5180 - 5240 802.11a CDD Mode		covered by the worst case 802.11n 20 MHz CDD					
	Power with	Antenna Array (Gain up to 6 dBi				
5180 - 5240	802.11n 20MHz CDD	10.20	10.14	13.18	20.80		
5190 - 5230	802.11n 40MHz CDD	12.12	12.26	15.20	33.12		
	Power with Antenna Array Gain up to 8.61 dBi						
5180 - 5240	802.11n 20MHz CDD	8.35	8.14	11.26	13.36		
5190 - 5230	802.11n 40MHz CDD	11.19	11.33	14.27	26.74		

5250 - 5350 MHz Authorized Band

Frequency Range (MHz)	Mode	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Total Peak Power (dBm)	Output Power (mW)		
5260 - 5320	802.11a Legacy	N/A	N/A	17.80	60.26		
5260 - 5320	5260 - 5320 802.11n 20MHz SISO covered by the worst case 802.11a Legacy testing						
5270 -5310	802.11n 40MHz SISO	N/A	N/A	N/A	N/A		
5260 - 5320 802.11a CDD Mode covered by the worst case 802.11n 20 MHz CDD							
	Power with	Antenna Array (Gain up to 6 dBi				
5260 - 5320	802.11n 20MHz CDD	16.20	16.16	19.19	82.99		
5270 -5310	802.11n 40MHz CDD	17.19	17.28	20.25	105.82		
Power with Antenna Array Gain up to 8.61 dBi							
5260 - 5320	802.11n 20MHz CDD	15.29	15.17	18.24	66.69		
5270 -5310	802.11n 40MHz CDD	17.19	17.28	20.25	105.82		

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Frequency	Mada	Peak Power	Peak Power	Total Peak	Output Power		
Range (MHz) Mode		Chain 0 (dBm)	Chain 1 (dBm)	Power (dBm)	(mW)		
5500 - 5700	802.11a Legacy	N/A	N/A	18.15	65.31		
5500 - 5700 802.11n 20MHz SISO covered by the worst case 802.11a Legacy testing							
5510 - 5670	5510 - 5670 802.11n 40MHz SISO		N/A	N/A	N/A		
5500 - 5700	5500 - 5700 802.11a CDD Mode covered by the worst case 802.11n 20 MHz CDD						
	Power with	Antenna Array (Gain up to 6 dBi				
5500 - 5700	802.11n 20MHz CDD	17.30	17.14	20.23	105.46		
5510 - 5670	5510 - 5670 802.11n 40MHz CDD		18.88	21.87	153.65		
Power with Antenna Array Gain up to 7.21 dBi							
5500 - 5700	802.11n 20MHz CDD	16.48	16.11	19.31	85.30		
5510 - 5670 802.11n 40MHz CDD		18.83	18.88	21.87	153.65		

5470 - 5725 MHz Authorized Band

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a stamped metal antenna (Hitachi, HMT05/HFT17-DL07), with a maximum gains as table below,

Band	Ant Main	Ant Aux	10^(Ant Main /10)	10^(Ant Aux/10)	10*(ant main/10)+10*(ant aux/10)	10*log[10*(ant main/10)+10*(ant aux/10)] (dBm)
5.15-5.25GHz	5.60	5.60	3.631	3.631	7.262	8.610
5.25-5.35GHz	5.60	5.60	3.631	3.631	7.262	8.610
5.4-5.725GHz	4.20	4.20	2.630	2.630	5.261	7.210

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was BCMWL5, rev. 4.170.63.0. The test utility software used during testing was wl_tool, rev. 4.170 RC63.0.

5.5. WORST-CASE CONFIGURATION AND MODE

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

All final tests in the 802.11a mode were made at 6 Mb/s.

All final tests in the 802.11n HT20 mode were made at MCS0.

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

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

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST							
Description	Description Manufacturer Model Serial Number FCC ID						
Laptop	Dell	Inspiron 1526	CN-0SE2C2-70166-77L-0011	DoC			
AC Adapter	Dell	HP-0Q065B83	CN-0N2765-7890-421-0063	DoC			

I/O CABLES

	I/O CABLE LIST								
Cable	Port	# of	Connector	Cable Remarks					
No.		Identica	Туре	Туре	Length				
		Ports							
1	AC	1	AC	Unshielded	1.2 m	N/A			
2	DC	1	DC	Unshielded	1.2 m	N/A			

TEST SETUP

The EUT is installed in a host laptop computer via Express card to MiniPCI-E adapter boards during the tests. Test software exercised the radio card.

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SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST								
Description	Manufacturer	Model	Asset	Cal Date	Cal Due			
EMI Receiver, 2.9 GHz	Agilent / HP	8542E	C00957	2/6/2007	6/12/2008			
RF Filter Section, 2.9 GHz	Agilent / HP	85420E	C00958	2/6/2007	6/12/2008			
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	5/9/2007	5/9/2008			
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/25/2007	10/25/2008			
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	10/25/2007	10/25/2008			
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	10/16/2006	1/27/2008			
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	5/2/2006	8/7/2008			
Antenna, Horn, 18 GHz	ETS	3117	C01006	4/15/2007	4/15/08			
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	8/3/2007	8/3/08			
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	10/13/2007	10/13/08			
Peak Power Meter	Agilent / HP	E4416A	C00963	02/14/07	12/02/08			
Peak / Average Power Sensor	Agilent	E9327A	C00964	02/14/07	12/02/08			
Antenna, Horn 26 ~ 40 GHz	ARA	MWH-2640/B	C01009	4/13/2008	4/13/2008			
4.0 GHz High Pass Filter	Micro Tronics	HPM13351	N/A	N/A	N/A			
2.4 - 2.5 Reject Filter	Micro Tronics	BRM50702	N/A	N/A	N/A			
7.6 GHz High Pass Filter	Micro Tronics	HPM13350	N/A	N/A	N/A			
5.75 - 5.8 Reject Filter	Micro Tronics	BRC13192	N/A	N/A	N/A			

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7. ANTENNA PORT TEST RESULTS FOR THE 5.15–5.25 GHZ

7.1. 802.11a MODE

7.1.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 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	19.092	16.4858
Middle	5200	19.155	16.5105
High	5240	19.384	16.5475



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7.1.2. OUTPUT POWER

LIMITS

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.

RESULTS

Limit

Channel	Frequency	Fixed	В	4 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5180	17	16.4858	16.17	5.60	16.17
Mid	5200	17	16.5105	16.18	5.60	16.18
High	5240	17	16.5475	16.19	5.60	16.19

Results

Channel	Frequency	Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5180	14.33	16.17	-1.84
Mid	5200	14.13	16.18	-2.05
High	5240	14.14	16.19	-2.05

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OUTPUT POWER





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OUTPUT POWER HIGI	НСН		RТ	BV	V/Avg
Ch Freq 5.24 GHz Channel Power			Trig Free	Auto	Res BW 1.0 MHz <u>Man</u> Video BW 3.0 MHz
Project: 07U11529 Ref 30 dBm Atten 30 dB #Samp Log 10 dB/ Offst 17.5 dB Center 5.240 00 GHz			Span 36 MHz	Auto Auto On Avg/Vł	Man VBW/RBW 1.00000 Man Average 100 Off BW Type Pwr (RMS) • Man
#Res BW 1 MHz #VBW 3 MHz Sweep 20 ms (601 pts) Channel Power Power Spectral Density 14.14 dBm / 24.0000 MHz -59.67 dBm/Hz					pan/RBW 106 <u>Man</u>

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7.1.3. PEAK POWER SPECTRAL DENSITY

LIMITS

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 less than or equal to 6 dBi, therefore the limit is 4 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

Channel	Frequency	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5180	3.881	4	-0.12
Middle	5200	3.228	4	-0.77
High	5240	3.775	4	-0.23

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POWER SPECTRAL DENSITY





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PSD HIGH CH	008	R	Т	BW/Avg	
Ch Freq 5.24 Channel Power	Ch Freq 5.24 GHz Trig Free				
Project: 07U11529	- ID	Mkr1 5.236 40	GHz	Video BW 3.0 MHz Auto <u>Man</u>	
Ref 30 dBm Atten 3 #Samp Log 10			IBm	VBW/RBM 1.00000 <u>Auto Man</u>	
dB/ Offst 17.5 dB				Average 100 <u>On Off</u>	
DI 4.0 dBm			www.	Avg/VBW lype Pwr (RMS) • Auto <u>Man</u>	
#PAvg 100 W1 S2				Span/DRW/	
Center 5.240 00 GHz #Res BW 1 MHz	#VBW 3 MHz	Span 36 Sweep 20 ms (601 p	MHz ots)	Auto Man	
Copyright 2000-2007 Agilent Teo	chnologies			I	

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7.1.4. PEAK EXCURSION

LIMITS

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 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	9.97	13	-3.03
Middle	5200	10.46	13	-2.54
High	5240	9.11	13	-3.89

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PEAK EXCURSION





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PEAK EXCURSION	N HIGH CH			
🔆 🔆 Agilent 01:19:26 Jan 11,	2008	F	? T	BW/Avg
Ch Freq 5.24 Channel Power	GHz	Trig	Free	Res BW 1.0 MHz Auto <u>Man</u>
Project: 07U11529	30 dB	۵ Mkr1 ۹ 1	0 Hz	Video BW 3.0 MHz Auto <u>Man</u>
#Peak Attended Top			*	VBVV/RBV 1.00000 <u>Auto Man</u>
dB/ Offst 17.5 dB				Average 100 On <u>Off</u>
and a standard and a			- Maleka	Avg/VBVV lype Pwr (RMS) • Auto <u>Man</u>
#PAvg				
V1 V2				Span/RBW/
Center 5.240 00 GHz #Res BW 1 MHz	#VBW 3 MHz	Span 3 Sweep 20 ms (601	6 MHz pts)	106 Auto Man
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7.1.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

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.

Limit line = -27 - EUT Antenna Gain

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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7.2. 802.11n HT20 MODE

7.2.1. 26 dB and 99% BANDWIDTH

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer. 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	19.744	17.4872
Middle	5200	19.406	17.6707
High	5240	19.335	16.4073



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7.2.2. OUTPUT POWER

LIMITS

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.

RESULTS

6 dBi Antenna Gain

Limit

Channel	Frequency	Fixed	В	4 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5180	17	19.744	16.95	6.00	16.95
Mid	5200	17	19.406	16.88	6.00	16.88
High	5240	17	19.335	16.86	6.00	16.86

Individual Chain Results

Channel	Frequency	Chain 0	Chain 1	Total	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	10.20	10.14	13.18	16.95	-3.77
Mid	5200	10.16	10.06	13.12	16.88	-3.76
High	5240	10.14	10.13	13.15	16.86	-3.72

8.61 dBi Antenna Gain

Limit

Channel	Frequency	Fixed	В	4 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5180	17	19.744	16.95	8.61	14.34
Mid	5200	17	19.406	16.88	8.61	14.27
High	5240	17	19.335	16.86	8.61	14.25

Individual Chain Results

Channel	Frequency	Chain 1	Chain 2	Total	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	8.35	8.14	11.26	14.34	-5.99
Mid	5200	8.24	8.16	11.21	14.27	-6.03
High	5240	8.20	8.13	11.18	14.25	-6.05

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CHAIN 0 OUTPUT POWER With 6 dBi antenna gain





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CHAIN 1 OUTPUT POWER with 6 dBi Antenna Gain





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CHAIN 0 OUTPUT POWER with 8.61 dBi Antenna Gain





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CHAIN 1 OUTPUT POWER with 8.61 dBi Antenna Gain





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7.2.3. PEAK POWER SPECTRAL DENSITY

LIMITS

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 less than or equal to 6 dBi, therefore the limit is 4 dBm.

The maximum antenna gain is 8.61 dBi, therefore the limit is 1.39 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 (COMBINER IS WORST-CASE)

6dBi Antenna Gain

Channel	Frequency	PPSD With Combiner	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5180	3.456	4.00	-0.54
Middle	5200	3.820	4.00	-0.18
High	5240	3.668	4.00	-0.33

8.61dBi Antenna Gain

Channel	Frequency	PPSD With Combiner	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5180	1.243	1.39	-0.15
Middle	5200	1.223	1.39	-0.17
High	5240	1.245	1.39	-0.15

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POWER SPECTRAL DENSITY WITH COMBINER (With 6 dBi Antenna Gain)





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POWER SPECTRAL DENSITY WITH COMBINER (With 8.61 dBi Antenna Gain)





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PSD HIGH CH, WI		рт	DIAIIAua
Ch Freq 5.24	GHz	Trig Free	Res BW 1.0 MHz
Channel Power			Auto <u>Man</u> Video BW 3.0 MHz
Project: 07U11529 Ref 30 dBm Atten #Samp	30 dB	Mkr1 5.242 82 GHz 1.245 dBm	Auto <u>Man</u> VBW/RBV
Log 10 dB/			Auto Man Average
Offst 17.5 dB			100 <u>On Off</u> Avg0/BW/Type
DI 4.0 dBm			Aug/vD001999 Pwr (RMS) • Auto <u>Man</u>
#PAvg			
Center 5.240 00 GHz #Res BW 1 MHz	#VBW 3 MHz	Span 36 MHz Sween 20 ms (601 nts)	Span/RBW 106 Auto Man
Copyright 2000-2007 Agilent Te	echnologies	54566 25 m3 (661 pt3)	

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7.2.4. PEAK EXCURSION

LIMITS

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.

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.

<u>RESULTS</u>

Chain 1

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5180	8.97	13	-4.03
Middle	5200	8.30	13	-4.70
High	5240	9.33	13	-3.67

Chain 2

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5180	9.96	13	-3.04
Middle	5200	10.12	13	-2.88
High	5240	10.52	13	-2.48

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PEAK EXCURSION (CHAIN 0)





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PEAK EXCURSIO	N HIGH CH				
🔆 Agilent 10:27:54 Jan 12,	2008		RΤ	BW	(Avg
Ch Freq 5.24 Channel Power	4 GHz		Trig Free	Auto	Res BW 1.0 MHz <u>Man</u>
Project: 07U11529	20.40	۵	Mkr1 0 Hz	V Auto	ideo BW 3.0 MHz <u>Man</u>
#Peak Allen			**	VI <u>Auto</u>	BVV/RBV 1.00000 <u>Man</u>
dB/ / /				A On	verage 100 <u>Off</u>
			and the second	Avg/VB\ Pv Auto	/V Type wr (RMS) ► <u>Man</u>
#PAvg					
V1 V2				Sp	an/RBW
Center 5.240 00 GHz #Res BW 1 MHz	#VBW 3 MHz	S Sweep 20 ms	pan 36 MHz s (601 pts)	<u>Auto</u>	106 <u>Man</u>
Copyright 2000-2007 Agilent T	echnologies				

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PEAK EXCURSION (CHAIN 1)





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PEAK EXCURSION	I HIGH CH			
🔆 Agilent 10:41:01 Jan 12, 2	2008		RΤ	BW/Avg
Ch Freq 5.24 Channel Power	GHz		Trig Free	Res BW 1.0 MHz Auto <u>Man</u>
Project: 07U11529		1 Δ	Mkr1 O Hz	Video BW 3.0 MHz Auto <u>Man</u>
Ref 30 dBm Atten 3 #Peak Log 10	30 dB		10.52 dB	VBW/RBW 1.00000 <u>Auto Man</u>
dB/ Offst 17.5	where the second where the			Average 100 On <u>Off</u>
dB			and the second s	Avg/VBW Type Pwr (RMS)∙ Auto <u>Man</u>
#PAvg				
			20 Mile	Span/RBW
#Res BW 1 MHz	#VBW 3 MHz	sp Sweep 20 ms	an 36 MHZ (601 pts)	Auto Man
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7.2.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

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.

Limit line = -27 - EUT Antenna Gain

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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7.3. 802.11n HT40 MODE

7.3.1. 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	5190	38.531	36.2652
High	5230	38.322	36.1421

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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

6dBi Antenna Gain

Limit

Channel	Frequency	Fixed	В	4 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5190	17	38.531	19.86	6.00	17.00
High	5230	17	38.322	19.83	6.00	17.00

Individual Chain Results

Channel	Frequency	Chain 0	Chain 1	Total	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5190	12.07	12.31	15.20	17.00	-1.80
High	5230	12.12	12.26	15.20	17.00	-1.80

8.61dBi Antenna Gain

Limit

Channel	Frequency	Fixed	В	4 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5190	17	38.531	19.86	8.61	14.39
High	5230	17	38.322	19.83	8.61	14.39

Individual Chain Results

Channel	Frequency	Chain 0	Chain 1	Total	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5190	11.03	11.27	14.16	14.39	-0.23
High	5230	11.19	11.33	14.27	14.39	-0.12

CHAIN 0 OUTPUT POWER (With 6 dBi Antenna Gain)





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CHAIN 1 OUTPUT POWER (With 6 dBi Antenna Gain)





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CHAIN 0 OUTPUT POWER (With 8.61 dBi Antenna Gain)





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CHAIN 1 OUTPUT POWER (With 8.61 dBi Antenna Gain)





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7.3.3. PEAK POWER SPECTRAL DENSITY

LIMITS

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 less than or equal to 6 dBi, therefore the limit is 4 dBm.

The maximum antenna gain is 8.61 dBi, therefore the limit is 1.39 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

6dBi Antenna Gain

Channel	Frequency	PPSD With Combiner	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5190	2.221	4	-1.78
High	5230	2.204	4	-1.80

8.61dBi Antenna Gain

Channel	Frequency	PPSD With Combiner	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5190	1.113	1.39	-0.28
High	5230	1.005	1.39	-0.39

POWER SPECTRAL DENSITY WITH COMBINER (6 dBi Antenna Gain)





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POWER SPECTRAL DENSITY WITH COMBINER (8.61 dBi Antenna Gain)





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7.3.4. PEAK EXCURSION

LIMITS

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

CHAIN 0

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5190	11.90	13	-1.10
High	5230	10.30	13	-2.70

CHAIN 1

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5190	10.79	13	-2.21
High	5230	10.25	13	-2.75

PEAK EXCURSION (CHAIN 0)





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PEAK EXCURSION (CHAIN 1)





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7.3.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

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.

Limit line = -27 - EUT Antenna Gain

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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SPURIOUS EMISSIONS WITH COMBINER





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8. ANTENNA PORT TEST RESULTS FOR THE 5.25–5.35 GHZ

8.1. 802.11a MODE

8.1.1. 26 dB and 99% BANDWIDTH

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 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	5260	23.422	16.4938
Middle	5300	22.991	16.5078
High	5320	22.527	16.4531



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8.1.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25-5.35 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 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.

<u>RESULTS</u>

Limit

Channel	Frequency	Fixed	В	11 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5260	24	16.4938	23.17	5.60	23.17
Mid	5300	24	16.5078	23.18	5.60	23.18
High	5320	24	16.4531	23.16	5.60	23.16

Results

Channel	Frequency	Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5260	17.63	23.17	-5.54
Mid	5300	17.80	23.18	-5.38
High	5320	15.53	23.16	-7.63

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OUTPUT POWER





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OUTPUT POWER HIGH CH	BW/Ava			
Ch Freq 5.32 GHz Trig Free Channel Power	Res BW 1.0 MHz Auto <u>Man</u> Video BW			
Ref 30 dBm Atten 30 dB #Samp	3.0 MHz Auto <u>Man</u> VBW/RBV 1.00000 Auto Man Average 100 On Off Avg/VBW Type			
Pwr Center 5.320 00 GHz #Res BW 1 MHz #VBW 3 MHz Sweep 20 ms (601 pts) Channel Power Power Spectral Density 15.53 dBm / 24.0000 MHz -58.27 dBm/Hz Auto				
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8.1.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25–5.35 GHz band, the peak power spectral density shall not exceed 11 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 less than or equal to 6 dBi, therefore the limit is 11 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>

Channel	Frequency	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5260	6.70	11	-4.30
Middle	5300	7.18	11	-3.82
High	5320	5.08	11	-5.92

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POWER SPECTRAL DENSITY





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PSD HIGH CH	008	R	T BW/Avg
Ch Freq 5.32 Channel Power	GHz	Trig Fi	ree Res BW 1.0 MHz Auto <u>Man</u>
Project: 07U11529 Rof 30 dBm Atton 3	0 dB	Mkr1 5.317 06 GF	Video BW 3.0 MHz Hz Auto <u>Man</u>
#Samp Log 10			VBW/RBV 1.00000 <u>Auto Man</u>
dB/ Offst 17.5 dB			Average 100 <u>On Off</u>
DI 11.0 dBm			Avg/VBVVType Pwr (RMS) • Auto <u>Man</u>
#PAvg			
Center 5.320 00 GHz #Res BW 1 MHz	#VBW 3 MHz	Span 36 M Sweep 20 ms (601 pts	MHz Span/RBVV MHz 106 s) <u>Auto Man</u>
Copyright 2000-2007 Agilent Teo	chnologies		

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8.1.4. PEAK EXCURSION

LIMITS

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 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.

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5260	10.96	13	-2.04
Middle	5300	10.81	13	-2.19
High	5320	10.03	13	-2.97

RESULTS

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PEAK EXCURSION





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PEAK EXCURSION	HIGH CH			
🄆 Agilent 01:35:39 Jan 11, 2	008		RΤ	BW/Avg
Ch Freq 5.32 Channel Power	GHz		Trig Free	Res BW 1.0 MHz Auto <u>Man</u>
Project: 07U11529 Ref 30 dBm Atten 3	0 dB	۵	Mkr1 0 Hz	Video BW 3.0 MHz Auto <u>Man</u>
#Peak Log 10	allster and the second		*_	VBW/RBW 1.00000 <u>Auto Man</u>
dB/ Offst 17.5 dB			MAN WILL IN	100 On <u>Off</u>
			and and a second se	Auto Man
#PAvg V1 V2				
Center 5.320 00 GHz #Res BW 1 MHz	#VBW 3 MHz	Sweep 20 ms	pan 36 MHz s (601 pts)	Span/RBVV 106 <u>Auto Man</u>
Copyright 2000-2007 Agilent Teo	chnologies			

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8.1.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (2)

IC RSS-210 A9.3 (2)

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

Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

Limit line = -27 - EUT Antenna Gain

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.

<u>RESULTS</u>

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SPURIOUS EMISSIONS





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HIGH	CHANN	IEL SP	URIOUS					
Project:	lent 00:36:51 07U11529	Jan 12, 20	108		Mki	F 4 15.95	R T 18 GHz	
Ref 15.3 #Peak	idBm ∳	#Atten 14	dB			-45.38	dBm	1 2 3 <u>4</u>
Log 10 dB/								Normal
dB		3 •			A	~~	~	Delta
-32.6 dBm LgAv								Delta Pair (Tracking Ref)
L Start 30 #Res BV	MHz N 1 MHz		#VBW 1 M	IHz Sw	Sto eep 199.9 n	op 40.00 ns (2001	0 GHz pts)	Span Pair
Marker	Trace	Туре	X	Axis		Amplitu	Jde	Span <u>Center</u>
1 2 3 4	(1) (1) (1) (1)	Freq Freq Freq Freq	5.3 37.1 10.6 15.9	26 GHz D2 GHz 42 GHz 58 GHz		11.39 dE -34.77 dB -45.01 dB -45.38 dB	9m Im Im Im	Off
								More 1 of 2
Copyrigh	nt 2000-2007 .	Agilent Tecl	nologies					

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8.2. 802.11n HT20 MODE

8.2.1. 26 dB and 99% BANDWIDTH

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer. 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	5260	19.655	17.6679
Middle	5300	19.251	17.7197
High	5320	20.648	17.7148

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26 dB and 99% BANDWIDTH





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8.2.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25-5.35 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 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

6dBi antenna Gain

Limit

Channel	Frequency	Fixed	В	11 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5260	24	19.655	23.93	6.00	23.93
Mid	5300	24	19.251	23.84	6.00	23.84
High	5320	24	20.648	24.15	6.00	24.00

Individual Chain Results

Channel	Frequency	Chain 0	Chain 1	Total	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5260	16.20	16.16	19.19	23.93	-4.74
Mid	5300	16.13	16.00	19.08	23.84	-4.77
High	5320	14.38	14.36	17.38	24.00	-6.62

8.61dBi antenna Gain

Note:

High channel still meets the Peak Power and PPSD limits of high antenna gain. It utilizes the same power level for all antennas; and the power data of high channel in table below is from 6dBi data.

Limit

Channel	Frequency	Fixed	В	11 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5260	24	19.655	23.93	6.00	23.93
Mid	5300	24	19.251	23.84	6.00	23.84
High	5320	24	20.648	24.15	6.00	24.00

Individual Chain Results

Channel	Frequency	Chain 0	Chain 1	Total	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5260	15.29	15.17	18.24	23.93	-5.69
Mid	5300	15.24	15.25	18.26	23.84	-5.59
High	5320	14.38	14.36	17.38	24.00	-6.62

CHAIN 0 OUTPUT POWER (6 dBi Antenna Gain)





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CHAIN 10UTPUT POWER (6 dBi Antenna Gain)





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CHAIN 0 OUTPUT POWER (8.61 dBi Antenna Gain)





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CHAIN 1 OUTPUT POWER (8.61 dBi Antenna Gain)





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8.2.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25-5.35 GHz band, the peak power spectral density shall not exceed 11 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 less than or equal to 6 dBi, therefore the limit is 11 dBm.

The maximum antenna gain is 8.61 dBi, therefore the limit is 8.39 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

6d Bi Antenna Gain

Channel	Frequency	PPSD With Combiner	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5260	9.328	11.00	-1.67
Middle	5300	9.345	11.00	-1.66
High	5320	7.200	11.00	-3.80

8.61d Bi Antenna Gain

Note: High channel still meets the PPSD limit of high antenna gain. It utilizes the same power level for all antennas; 8.61dBi data below only show differences for low and mid channels.

Channel	Frequency	PPSD With Combiner	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5260	8.322	8.39	-0.07
Middle	5300	8.266	8.39	-0.12

POWER SPECTRAL DENSITY WITH COMBINER (6 dBi Antenna Gain)





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POWER SPECTRAL DENSITY WITH COMBINER (8.61 dBi Antenna Gain)





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8.2.4. PEAK EXCURSION

LIMITS

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.

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

Chain 1

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5260	8.93	13	-4.07
Middle	5300	9.90	13	-3.10
High	5320	11.24	13	-1.76

Chain 2

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5260	9.82	13	-3.18
Middle	5300	10.47	13	-2.53
High	5320	10.30	13	-2.70

PEAK EXCURSION (CHAIN 0)





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PEAK EXCURSION	HIGH CH			
🔆 Agilent 15:12:19 Jan 12, 2	008		RΤ	BW/Avg
Ch Freq 5.32 Channel Power	GHz		Trig Free	Res BW 1.0 MHz Auto <u>Man</u>
Project: 07U11529	0.4B	Δ	Mkr1 0 Hz	Video BW 3.0 MHz Auto <u>Man</u>
#Peak Log 10			**	VBW/RBV 1.00000 <u>Auto Man</u>
dB/ Offst 17.5	and the second second	and the second sec		Average 100 On <u>Off</u>
				Avg/VBW Type Pwr (RMS) ^ Auto <u>Man</u>
#PAvg				
Center 5.320 00 GHz #Res BW 1 MHz	#VBW 3 MHz	Sweep 20 ms	pan 36 MHz ; (601 pts)	Span/RBW 106 <u>Auto Man</u>
Copyright 2000-2007 Agilent Teo	chnologies			

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PEAK EXCURSION (CHAIN 1)





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PEAK EXCURSION	I HIGH CH			
🔆 🔆 Agilent 15:16:52 Jan 12, 3	2008		RΤ	BW/Avg
Ch Freq 5.32 Channel Power	GHz		Trig Free	Res BW 1.0 MHz Auto <u>Man</u>
Project: 07U11529		۵	Mkr1 0 Hz	Video BW 3.0 MHz Auto <u>Man</u>
Ref 30 dBm Atten : #Peak Log 10	20 dB	, ,	10.30 dB	VBW/RBW 1.00000 <u>Auto Man</u>
dB/ Offst 17.5				Average 100 On <u>Off</u>
dB				Avg/VBW Type Pwr (RMS) • Auto <u>Man</u>
#PAvg				
V1 V2			nan 36 MHz	Span/RBW
#Res BW 1 MHz	#VBW 3 MHz	Sweep 20 ms	s (601 pts)	Auto Man
Copyright 2000-2007 Agilent Te	chnologies			

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8.2.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (2)

IC RSS-210 A9.3 (2)

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

Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

Limit line = -27 - EUT Antenna Gain

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.

<u>RESULTS</u>

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SPURIOUS EMISSIONS WITH COMBINER





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8.3. 802.11n HT40 MODE

8.3.1. 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)
Middle	5270	38.728	36.2103
High	5310	38.540	36.1414

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26 dB and 99% BANDWIDTH





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8.3.2. OUTPUT POWER

<u>LIMITS</u>

FCC §15.407 (a) (2) IC RSS-210 A9.2 (2)

For the 5.25-5.35 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 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

6dBi Antenna Gain

Limit

Channel	Frequency	Fixed	В	11 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5270	24	38.728	26.88	6.00	24.00
High	5310	24	38.540	26.86	6.00	24.00

Individual Chain Results

Channel	Frequency	Chain 0	Chain 1	Total	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5270	17.19	17.28	20.25	24.00	-3.75
High	5310	12.51	12.73	15.63	24.00	-8.37

8.61dBi Antenna Gain

Low & high channels still meet the Peak Power and PPSD limits of high antenna gain. These channels utilize the same power level for all antennas. The channel power data in table below is from 6dBi data.

Limit

Channel	Frequency	Fixed	В	11 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5270	24	38.728	26.88	8.61	21.39
High	5310	24	38.540	26.86	8.61	21.39

Individual Chain Results

Channel	Frequency	Chain 1	Chain 2	Total	Limit	Margin
		Power	Power	Power		
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5270	17.19	17.28	20.25	21.39	-1.14
High	5310	12.51	12.73	15.63	21.39	-5.76
CHAIN 0 OUTPUT POWER (6dBi & 8.61dBi Antenna Gains)





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CHAIN 1 OUTPUT POWER (6dBi & 8.61dBi Antenna Gains)





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8.3.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25-5.35 GHz band, the peak power spectral density shall not exceed 11 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 less than or equal to 6 dBi, therefore the limit is 11 dBm.

The maximum antenna gain is 8.61 dBi, therefore the limit is 8.39 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

6dBi Antenna Gain

Channel	Frequency	PPSD With Combiner	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5270	7.486	11	-3.51
High	5310	3.050	11	-7.95

8.61dBi Antenna Gain

Low & high channels still meet the PPSD limit of high antenna gain. These channels utilize the same power level for all antennas, 8.61dBi data in table below is from 6dBi data.

Channel	Frequency	PPSD With Combiner	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5270	7.486	8.39	-0.90
High	5310	3.050	8.39	-5.34

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POWER SPECTRAL DENSITY WITH COMBINER (6dBi & 8.61dBi Antenna Gains)





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8.3.4. PEAK EXCURSION

LIMITS

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.

<u>RESULTS</u>

CHAIN 1

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5270	11.97	13	-1.03
High	5310	10.91	13	-2.09

CHAIN 2

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5270	11.00	13	-2.00
High	5310	10.42	13	-2.58

PEAK EXCURSION (CHAIN 0)





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PEAK EXCURSION (CHAIN 1)





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8.3.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (2)

IC RSS-210 A9.3 (2)

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

Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

Limit line = -27 - EUT Antenna Gain

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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SPURIOUS EMISSIONS WITH COMBINER





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9. ANTENNA PORT TEST RESULTS FOR THE BAND 5.47–5.725 GHZ 9.1. 802.11a MODE

9.1.1. 26 dB and 99% BANDWIDTH

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 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

Frequency	26 dB Bandwidth	99% Bandwidth
(MHz)	(MHz)	(MHz)
5500	19.221	16.6231
5600	23.467	16.6043
5700	27.564	16.9636

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26 dB and 99% BANDWIDTH





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BANDWIDTH HIGH CH Agilent 11:44:09 Jan 17, 2008 R T	Freq/Channel
Ch Freq 5.7 GHz Trig Free Occupied Bandwidth	Center Freq 5.70000000 GHz
Project: 07111529	Start Freq 5.67500000 GHz
Ref 20 dBm Atten 20 dB #Samp	Stop Freq 5.72500000 GHz CF Step 5.00000000 MHz <u>Auto Man</u> Freq Offset 0.00000000 Hz
Occupied Bandwidth Occ BW % Pwr 99.00 % 16.9636 MHz x dB -26.00 dB	Signal Track On <u>Off</u>
Transmit Freq Error -11.391 kHz x dB Bandwidth 27.564 MHz*	

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9.1.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 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.

<u>RESULTS</u>

Limit

Channel	Frequency	Fixed	В	11 + 10 Log B	Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)
Low	5500	24	19.221	23.84	4.20	23.84
Mid	5600	24	23.467	24.70	4.20	24.00
High	5700	24	27.564	25.40	4.20	24.00

Results

Channel	Frequency	Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5500	17.26	23.84	-6.58
Mid	5600	17.69	24.00	-6.31
High	5700	18.15	24.00	-5.85

OUTPUT POWER





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OUTPUT POWER Agilent 11:45:18 Jan 17,	HIGH CH 2008	RT	BW/Avg
Ch Freq 5.7 Channel Power	GHz	Trig Free	Res BW 1.0 MHz Auto <u>Man</u> Video BW 3.0 MHz
Project: 07U11529 Ref 30 dBm Atten #Samp Log 10 dB/ Offst 17.7 dB Center 5.700 000 GHz #Res BW 1 MHz	30 dB	Span 45 MHz	Auto <u>Man</u> VBW/RBW 1.00000 <u>Auto Man</u> Average 100 <u>On Off</u> Avg/VBW Type Pwr (RMS) • Auto <u>Man</u>
Channel Power 18.15 dBm / 30.0 Copyright 2000-2007 Agilent T	0000 MHz echnologies	Power Spectral Density -56.63 dBm/Hz	Span/RBW 106 <u>Auto Man</u>

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9.1.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the peak power spectral density shall not exceed 11 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 less than or equal to 6 dBi, therefore the limit is 11 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

Channel	Frequency	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5500	6.688	11	-4.31
Middle	5600	7.410	11	-3.59
High	5700	8.162	11	-2.84

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POWER SPECTRAL DENSITY





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PSD HIGH CH	2008	R	Т	B	///Avg
Ch Freq 5.7 Channel Power	GHz	Trig	Free	Auto	Res BV 1.0 MHz <u>Mar</u>
Project: 07U11529	20 dB	Mkr1 5.696 025	GHz	Auto	Video BV 3.0 MHz <u>Mar</u>
#Samp Log 10				<u>Auto</u>	VBW/RBV 1.00000 <u>Mar</u>
dB/ Offst 17.7				<u>On</u>	Average 100 <u>Off</u>
DI 11.0 dBm			****	Avg/V Auto	BW Type Pwr (RMS) <u>Ma</u>
#PAvg 100 W1 S2					
Center 5.700 000 GHz #Res BW 1 MHz	#VBW 3 MHz	Span 45 Sweep 20 ms (601 j	5 MHz pts)	Auto S	pan/RBV 106 <u>Mai</u>
Copyright 2000-2007 Agilent Te	chnologies				

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9.1.4. PEAK EXCURSION

LIMITS

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 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.

Channel	Frequency	Peak Excursion	Limit	Margin	
	(MHz)	(dB)	(dB)	(dB)	
Low	5500	10.22	13	-2.78	
Middle	5600	9.90	13	-3.10	
High	5700	9.00	13	-4.00	

RESULTS

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PEAK EXCURSION





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PEAK EXCURSION	I HIGH CH		D T	
			BVWAVg	
Ch Freq 5.7 Channel Power		Trig Free	Res BW 1.0 MHz Auto <u>Man</u>	
Project: 07U11529	20 dB	4	Mkr1 0 Hz	Video BW 3.0 MHz Auto <u>Man</u>
#Peak Attent	pt-contraction of the second		**	VBW/RBV 1.00000 <u>Auto Man</u>
dB/ Offst 17.7		- Charlington	and the second second	Average 100 On <u>Off</u>
ab Marine and a second			- Th	Avg/VBW Type Pwr (RMS) ► Auto <u>Man</u>
#PAvg				
V1 V2				Span/RBW
Center 5.700 000 GHz #Res BW 1 MHz #VBW 3 MHz		Span 45 MHz Sweep 20 ms (601 pts)		106 <u>Auto Man</u>
Copyright 2000-2007 Agilent Technologies				

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