



FCC CFR47 PART 15 SUBPART E INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

802.11a/g/n WLAN + Bluetooth PCI-E Custom Combination Card

MODEL NUMBER: BCM94331PCIEBT3B

FCC ID: QDS-BRCM1066 IC: 4324A-BRCM1066

REPORT NUMBER: 12U14373-3, Revision C

ISSUE DATE: JULY 13, 2012

Prepared for BROADCOM CORPORATION 190 MATHILDA PLACE SUNNYVALE, CA 94086, U.S.A.

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
	06/28/12	Initial Issue	F. Ibrahim
A	06/29/12	Updated section 5.5, some tables to reflect correct channels and added radiated BE 5725-2825 MHz for some modes.	F. Ibrahim
В	06/30/12	Added DFS data	T. Lee
С	07/13/12	Updated Legacy and SISO Radiated Bandedge	T. Chan

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1. ATTESTATION OF TEST RESULTS

DATE TESTED:	MAY 12 – JULY 13, 2012
SERIAL NUMBER:	C962154016AF2GQBL & C962154015FF2GQBL (P101)
MODEL:	BCM94331PCIEBT3B
EUT DESCRIPTION:	802.11a/b/g/n WLAN + Bluetooth PCI-E Custom Combination Card
COMPANY NAME:	BROADCOM CORPORATION 190 MATHILDA PLACE SUNNYVALE, CA 94086, U.S.A.

APPLICABLE STANDARDS				
STANDARD	TEST RESULTS			
CFR 47 Part 15 Subpart E	Pass			
INDUSTRY CANADA RSS-210 Issue 8 Annex 9	Pass			
INDUSTRY CANADA RSS-GEN Issue 3	Pass			

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. 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 UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

FRANK IBRAHIM EMC SUPERVISOR UL CCS

Tested By:

VIEN TRAN EMC ENGINEER UL CCS

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 06-96, FCC KDB 789033, ANSI C63.4-2003, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL 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. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB) 36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 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 an 802.11a/g/n WLAN + Bluetooth PCI-E Custom Combination Card

The radio module is manufactured by Broadcom.

5.2. MAXIMUM RMS OUTPUT POWER

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

5.2GHz BAND

Frequency Range	Mode	Output Power	Output Power	
(MHz)		(dBm)	(mW)	
5.2 GHz band, 1TX	•			
5180 - 5240	802.11a	14.463	27.945	
5190 - 5230	802.11n HT40	16.271	42.374	
5.2 GHz band, 2TX				
5180 - 5240	802.11n HT20 CDD MCS0	12.497	17.771	
5180 - 5240	802.11n HT20 STBC MCS0	14.966	31.376	
5190 - 5230	802.11n HT40 CDD MCS0	14.589	28.767	
5.2 GHz band, 3TX				
5180 - 5240	802.11n HT20 STBC MCS0	14.728	29.703	
5190 - 5230	802.11n HT40 STBC MCS0	16.980	49.888	

5.3 GHz BAND

Frequency Range	Mode	Output Power	Output Power	
(MHz)		(dBm)	(mW)	
5.3 GHz band, 1TX				
5260 - 5320	802.11a	19.365	86.397	
5270 - 5310	802.11n HT40	18.141	65.178	
5.3 GHz band, 2TX	5.3 GHz band, 2TX			
5270 - 5310	802.11n HT40 CDD MCS0	21.277	134.184	
5.3 GHz band, 3TX				
5260 - 5320	802.11n HT20 CDD MCS0	17.779	59.965	
5260 - 5320	802.11n HT20 SDM MCS21	22.177	165.082	
5270 - 5310	802.11n HT40 CDD MCS0	20.067	101.555	
5270 - 5310	802.11n HT40 SDM MCS21	21.025	126.619	

5.6 GHz BAND

Frequency Range	Mode	Output Power	Output Power
(MHz)		(dBm)	(mW)
5.6 GHz band, 1TX			
5500-5700	802.11a	19.369	86.477
5510-5670	802.11n HT40 CDD MCS0	19.336	85.822
5.6 GHz band, 2TX			
5510-5670	802.11n HT40 CDD MCS0	19.754	94.493
5.6 GHz band, 3TX			
5500-5700	802.11n HT20 CDD MCS0	17.073	50.968
5500-5700	802.11n HT20 SDM MCS21	22.235	167.302
5510-5670	802.11n HT40 CDD MCS0	20.167	103.920
5510-5670	802.11n HT40 SDM MCS21	23.811	240.492

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

	FCC/IC/NCC FMA - BCM94331PCIEBT3B FCC ID: QDS-BRCM1066 IC ID: 4324A-BRCM1066												
No.	Antenna Manufacturer	Antenna Type	Model	Peak gain (2.4GHz band)	Peak gain (5.2GHz band)	Peak gain (5.3GHz band)	Peak gain (5.6GHz band)	Peak gain (5.8GHz band)					
1	Amphenol/Tyco	802.11abgn WLAN Antenna	631-1744 WiFi1	1.66	4.16	4	2.92	1.91					
1	Amphenol/Tyco	802.11abgn WLAN/BT Antenna	631-2082 WiFi2	1.11	2.51	3.81	4.71	4.18					
1	Amphenol/Tyco	802.11abgn WLAN Antenna	631-1771 WiFi3	6.77	5.65	5.61	5.35	4.39					

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom, rev. 5.106.98.77. The test utility software used during testing was BCM Internal, rev. 5.106.RC98.77.

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5.5. WORST-CASE CONFIGURATION AND MODE

The EUT was tested as an external module installed in a test jig board connected to a host Laptop PC. The EUT was oriented in a flat orientation, similar to the orientation it would have in real installations; see setup photos for details.

Worst-Case data rates, as provided by the client, were as follows:

All final tests in the 802.11a Legacy mode were made at 6 Mb/s. All final tests in the 802.11n 20 MHz CDD mode were made at MCS0. All final tests in the 802.11n 20 MHz STBC mode were made at MCS0. All final tests in the 802.11n 20 MHz SDM mode were made at MCS21.

All final tests in the 802.11n 40 MHz CDD mode were made at MCS0. All final tests in the 802.11n 40 MHz STBC mode were made at MCS0. All final tests in the 802.11n 40 MHz SDM mode were made at MCS21.

Worst-case mode and channel used for 30-1000 MHz radiated and power line conducted emissions was the mode and channel with the highest output power.

All legacy modes were measured with the highest gain for each type of antenna.

All MIMO modes were measured with the highest combination of gains for each type of antenna. Note that this combination of antennas will not be implemented in the end product. This combination was selected for testing purposes only, to accommodate the highest gain of each antenna type in one single test configuration. The combined gain of this test configuration is higher than any combined gain that will be implemented in the end product.

For the modes where CH2 and CH10 were tested for output power, all other test items at CH1 and CH11 were performed with the higher power level between CH1 and CH2, and between CH10 and CH11 as worst-case scenario.

For all modes with single chain SISO, chain 3 (J2) was used for both 2.4GHz and 5GHz band as worst case.

Radiated testing with three antennas connected was conducted and passed; therefore, no conducted RF spurious testing was performed.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

	Support Equipment List										
Description	Manufacturer	Model	Serial Number	FCC ID							
Laptop	Lenovo	G560	CPU4495771	DoC							
Laptop	Lenovo	G560	CPU4466228	DoC							
AC/DC Adapter	Lenovo	PA-1650-56LC	11S36001646ZZ400008KCM8	DoC							
AC/DC Adapter	Lenovo	PA-1650-56LC	11S36001646ZZ400011AAV4	DoC							
Adapter Board	Catalyst	MINI2EXP	BRCM 02	N/A							
Adapter Board	Catalyst	MINI2EXP	BRCM 01	N/A							
Adapter Board	Broadcom	BCM94331PCIBT4HAD	93	N/A							
Adapter Board	Broadcom	BCM94331PCIBT4HAD	101	N/A							

I/O CABLES

	I/O CABLE LIST											
Cable Port # of Connector Cable						Remarks						
No.		Identical Ports	Туре	Туре	Length							
1	AC	1	US 115V	Shielded	1.5m	NA						
2	DC	1	DC	Un-shielded	1.5m	Ferrite at laptop's end						

TEST SETUP

The EUT is attached to a jig board which is installed in the PCMCI slot of 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							
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/15/11	12/15/12							
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	09/02/11	09/02/12							
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	1000741	07/06/11	07/06/12							
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/19/11	08/19/13							
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/11	12/13/12							
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/11	12/13/12							
Antenna, Horn, 18 GHz	EMCO	3115	C00872	09/20/11	09/20/12							
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	07/28/11	07/28/12							
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	C00981	06/14/11	06/14/12							
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1		02/07/12	02/07/13							
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	07/12/11	07/12/12							
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	08/02/11	08/02/12							
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	11/11/11	11/11/12							
LISN, 30 MHz	FCC	50/250-25-2	C00626	12/13/11	12/13/12							
Reject Filter, 5.15-5.35 GHz	Micro-Tronics	BRC13190	N02679	CNR	CNR							
Reject Filter, 5.15-5.35 GHz	Micro-Tronics	BRC13190	N02680	CNR	CNR							
Reject Filter, 5.47-5.725 GHz	Micro-Tronics	BRC13191	N02678	CNR	CNR							

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7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

7.1.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time	Period	Duty Cycle	Duty	Duty Cycle	1/B
	В		x	Cycle	Correction Factor	Minimum VBW
	(msec)	(msec)	(linear)	(%)	(dB)	(kHz)
802.11a 20 MHz_Legacy	2.075	2.090	0.993	0.993	0.031	0.482
802.11n HT20 MCS0 CDD	1.920	1.935	0.992	0.992	0.034	0.521
802.11n HT20 MCS0 STBC	11.500	11.590	0.992	0.992	0.034	0.087
802.11n HT20 MCS21 SDM	0.683	1.063	0.643	0.643	1.921	1.464
802.11n HT40 MCS0 CDD	0.937	0.953	0.983	0.983	0.074	1.067
802.11n HT40 MCS0 STBC	0.940	0.958	0.982	0.982	0.081	1.064
802.11n HT40 MCS21 SDM	0.453	0.725	0.625	0.625	2.042	2.208

7.1.2. MEASUREMENT METHOD FOR POWER AND PPSD

When Duty Cycle is greater than or equal to 98%, KDB 789033 Method SA-1 is used.

When Duty Cycle is less than 98% and consistent, KDB 789033 Method SA-2 is used.

7.1.3. MEASUREMENT METHOD FOR AVG SPURIOUS EMISSIONS ABOVE 1 GHz

KDB 789033 Method VB with Power RMS Averaging is used for both cases of duty cycle greater than 98% and less than 98%.

7.1.4. DUTY CYCLE PLOTS





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						∆ Mk	r2 953	.3 μs	Soloc	t Markor
Ref 130 d	IBµ∨	Atten 20 dE	3				0.8	32 dB	1 2	3 2
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Center 5.	.310 000 GH	z					Spa	nn O Hz		Shan Dair
Res BW (B MHz		#VBW 50 M	Hz	S٧	veep 2	ms (601	pts)	Snan	Center
Marker	Trace	Туре	×.	Axis			Amplite	Jde	opan	<u></u>
1R	(1)	Time	49	B.7 μs		1	10.85 dBj	IV I		
1 <u>A</u> 2P	(1)	Time	93	5.7 µs в 7 µs		1	4.61 d 10 95 dB	18 07		∩ff
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-				F						
										More
										1 of 3
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8. ANTENNA PORT TEST RESULTS

8.1. 802.11a Legacy, 1TX, 5.2 GHz BAND

8.1.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel Frequency		26 dB Bandwidth
	(MHz)	(MHz)
Low	5180	27.33
Mid	5200	27.08
High	5240	26.58

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26 dB BANDWIDTH





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8.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel Frequency		99% Bandwidth
	(MHz)	(MHz)
Low	5180	16.5286
Mid	5200	16.5255
High	5240	16.5207

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99% BANDWIDTH





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BANDWIDTH HIGH CH	ł		RT	Sv	/eep
Ch Freq 5.24 GHz Occupied Bandwidth	Δ	verages: 100	Trig Free	Swe Auto	eep Time 100.0 ms <u>Man</u>
				<u>Single</u>	Sweep <u>Cont</u>
Ref 10 dBm Atten 10 dB #Samp Log 10	aling a subsection of the states of the stat			Auto <u>Norm</u>) Sweep Time <u>Accy</u>
dB/ Offst 10.8			www.	On	Gate <u>Off</u>
Center 5.240 00 GHz #Res BW 180 kHz #	VBW 560 kHz	#Sweep 20	Span 50 MHz ms (601 pts)	Gate	e Setup 🕨
Occupied Bandwidth 16.5207 I	MHz	Occ BW % Pwr x dB	99.00 % -26.00 dB		Points 601
Transmit Freq Error -19.176 x dB Bandwidth 22.419	B kHz I MHz*				
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8.1.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency	Power
	(MHz)	(dBm)
Low	5180	14.2
Mid	5200	14.1
High	5240	14.0

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8.1.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the band 5.15–5.25 GHz, 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. In addition, 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 maximum conducted output 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.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

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RESULTS

Limits

Channel	Frequency	Fixed	В	4 + 10 Log B	Directional	Power	PPSD
		Limit		Limit	Gain	Limit	Limit
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)	(dBm)
Low	5180	17	27.33	18.37	5.65	17.00	4.00
Mid	5200	17	27.08	18.33	5.65	17.00	4.00
High	5240	17	26.58	18.25	5.65	17.00	4.00

Output Power Results

Channel	Frequency	Meas	Corr'd	Power	Power
		Power	Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	14.463	14.463	17.00	-2.54
Mid	5200	14.422	14.422	17.00	-2.58
High	5240	13.984	13.984	17.00	-3.02

PPSD Results

Channel	Frequency	Meas	Corr'd	PPSD	PPSD
		PPSD	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	3.28	3.28	4.00	-0.72
Mid	5200	3.21	3.21	4.00	-0.79
High	5240	2.77	2.77	4.00	-1.23

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OUTPUT POWER AND PPSD





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8.1.5. 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.

RESULTS

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5180	8.70	13	-4.3
Mid	5200	9.01	13	-4.0
High	5240	8.32	13	-4.7

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PEAK EXCURSION





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8.2. 802.11n HT20, CDD MCS0, 2TX, 5.2 GHz BAND

8.2.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	26 dB BW	26 dB BW	
		Chain 1	Chain 2	
	(MHz)	(MHz)	(MHz)	
Low	5180	26.50	26.50	
Mid	5200	26.50	26.83	
High	5240	26.58	26.33	

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26 dB BANDWIDTH, Chain 1





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				Δ Mkr	1 26.58	3 MHz	
ef 20 dBm	Atten 20 dB				0.0)3 dB	Center Freq 5.24000000 GHz
og							
3/		And the second second					Start Freq 5.21500000 GHz
htst 0.8 3			$\left \right $				Stop Freq 5.26500000 GHz
5.3 5.3 3m 7 JAv 7					WHANK .		CF Step 5.00000000 MHz <u>Auto Mar</u>
1 S2 3 FC						and the second second	Freq Offset 0.00000000 Hz
f): Fun wp							Signal Track On <u>Off</u>

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26 dB BANDWIDTH, Chain 2





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8.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	99% BW	99% BW
		Chain 1	Chain 2
	(MHz)	(MHz)	(MHz)
Low	5180	17.6810	17.6517
Mid	5200	17.6671	17.6552
High	5240	17.6726	17.6378

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99% BANDWIDTH, Chain 1





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99% BANDWIDTH, Chain 2





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99% BANDWIDTH, Ch	ain 2 HIGH (СН	RТ	Sv	veep
Ch Freq 5.24 GHz Occupied Bandwidth	Avera	ages: 100	Trig Free	SW4 Auto	eep Time 20.00 ms <u>Man</u>
Ref 20 dBm Atten 20 dB #Samp Log 10 dB/ → Offst 10.8 dB				<u>Single</u> Auto <u>Norm</u> On	Sweep <u>Cont</u> o Sweep Time <u>Accy</u> Gate <u>Off</u>
Center 5.240 00 GHz #Res BW 180 kHz #	VBW 560 kHz	#Sweep 20 r	Span 50 MHz ns (601 pts)	Gat	e Setup ト
Occupied Bandwidth 17.6378 Transmit Freq Error -25.25	Oc MHz ^{14 kHz}	c BW % Pwr x dB	99.00 % -26.00 dB		Points 601
x dB Bandwidth 23.15. Copyright 2000-2010 Agilent Technol	2 MHz* ogies				

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8.2.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Average Power Results

Channel	Frequency	Chain 1	Chain 2	Total
		Power	Power	Power
	(MHz)	(dBm)	(dBm)	(dBm)
Low	5180	9.2	9.1	12.16
Mid	5200	9.1	8.9	12.01
High	5240	9.1	9.3	12.21

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8.2.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the band 5.15–5.25 GHz, 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. In addition, 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 maximum conducted output 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.

DIRECTIONAL ANTENNA GAIN

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

Chain 1	Chain 2	Correlated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
4.16	5.65	7.95

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RESULTS

Limits

Channel	Frequency	Fixed Limit	В	4 + 10 Log B Limit	Directional Gain	Power Limit	PPSD Limit
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)	(dBm)
Low	5180	17	26.50	18.23	7.95	15.05	2.05
Mid	5200	17	26.50	18.23	7.95	15.05	2.05
High	5240	17	26.33	18.20	7.95	15.05	2.05

Output Power Results

Channel	Frequency	Chain 1	Chain 2	Total	Power	Power
		Meas Power	Meas Power	Corr'd Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	9.259	9.312	12.296	15.05	-2.754
Mid	5200	9.155	9.789	12.494	15.05	-2.556
High	5240	9.567	9.404	12.497	15.05	-2.553

PPSD Results

Channel	Frequency	Chain 1	Chain 2	Total	PPSD	PPSD
		Meas PPSD	Meas PPSD	Corr'd PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	-2.50	-2.35	0.59	2.05	-1.46
Mid	5200	-2.62	-1.87	0.78	2.05	-1.27
High	5240	-2.11	-2.22	0.85	2.05	-1.20

OUTPUT POWER AND PPSD, Chain 1





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OUTPUT POWER AND PPSD, Chain 2



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8.2.5. 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.

RESULTS

Channel	Frequency	Pk Exc	Pk Exc	Limit	Worst-Case
		Chain 1	Chain 2		Margin
	(MHz)	(dB)	(dB)	(dB)	(dB)
Low	5180	9.15	10.22	13	-2.8
Mid	5200	9.10	10.28	13	-2.7
High	5240	10.22	10.32	13	-2.7

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PEAK EXCURSION, Chain 1





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PEAK EXCURSION, Chain 2



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8.3. 802.11n HT20, STBC MCS0, 2TX, 5.2 GHz BAND

8.3.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	26 dB BW	26 dB BW
		Chain 1	Chain 2
	(MHz)	(MHz)	(MHz)
Low	5180	27.33	27.50
Mid	5200	27.00	27.50
High	5240	26.58	26.92

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26 dB BANDWIDTH, Chain 1





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26 dB BANDWIDTH, Chain 2





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8.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	99% BW	99% BW
		Chain 1	Chain 2
	(MHz)	(MHz)	(MHz)
Low	5180	17.6428	17.6718
Mid	5200	17.6625	17.6538
High	5240	17.6568	17.6555

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99% BANDWIDTH, Chain 1





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99% BANDWIDTH, Chain 2





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99% BANDWIDTH, (Chain 2 HIGH CH	I R T	Sweep
Ch Freq 5.24 G Occupied Bandwidth	Hz Averages	Trig Free	Sweep Time 20.00 ms Auto <u>Man</u>
Ref 20 dBm Atten 20 #Samp Log 10 dB/ Offst 0ffst 10.8 dB			Sweep Single Cont Auto Sweep Time Norm Accy On Off
Center 5.240 00 GHz #Res BW 180 kHz	#VBW 560 kHz #S	Span 50 MHz iweep 20 ms (601 pts)	Gate Setup •
Occupied Bandwidt 17.655 Transmit Freq Error -2 x dB Bandwidth 23	h Occ B\ 55 MHz 4.238 kHz .573 MHz*	№ % Pwr 99.00 % xdB -26.00 dB	Points 601
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8.3.3. AVERAGE POWER

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Average Power Results

Channel	Frequency	Chain 1	Chain 2	Total	
		Power	Power	Power	
	(MHz)	(dBm)	(dBm)	(dBm)	
Low	5180	11.5	11.5	14.51	
Mid	5200	11.4	11.6	14.51	
High	5240	11.6	11.4	14.51	

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8.3.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the band 5.15–5.25 GHz, 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. In addition, 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 maximum conducted output 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.

DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Chain 1	Chain 2	Uncorrelated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
4.16	5.65	4.97

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RESULTS

Limits

Channel	Frequency	Fixed Limit	В	4 + 10 Log B Limit	Directional Gain	Power Limit	PPSD Limit
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)	(dBm)
Low	5180	17	27.33	18.37	4.97	17.00	4.00
Mid	5200	17	27.00	18.31	4.97	17.00	4.00
High	5240	17	26.58	18.25	4.97	17.00	4.00

Output Power Results

Channel	Frequency	Chain 1	Chain 2	Total	Power	Power
		Meas Power	Meas Power	Corr'd Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	11.922	11.989	14.966	17.00	-2.034
Mid	5200	11.741	12.039	14.903	17.00	-2.097
High	5240	12.000	10.766	14.437	17.00	-2.563

PPSD Results

Channel	Frequency	Chain 1	Chain 2	Total	PPSD	PPSD
		Meas PPSD	Meas PPSD	Corr'd PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	0.09	0.21	3.16	4.00	-0.84
Mid	5200	-0.05	0.19	3.08	4.00	-0.92
High	5240	0.17	-1.02	2.63	4.00	-1.37

OUTPUT POWER AND PPSD, Chain 1





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OUTPUT POWER AND PPSD, Chain 2



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8.3.5. 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.

RESULTS

Channel	Frequency	Pk Exc	Pk Exc	Limit	Worst-Case
		Chain 1	Chain 2		Margin
	(MHz)	(dB)	(dB)	(dB)	(dB)
Low	5180	9.84	9.98	13	-3.0
Mid	5200	9.97	10.28	13	-2.7
High	5240	9.72	10.32	13	-2.7

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PEAK EXCURSION, Chain 1





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PEAK EXCURSION, Chain 2



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8.4. 802.11n HT20, STBC MCS0, 3TX, 5.2 GHz BAND

8.4.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	26 dB BW	26 dB BW	26 dB BW
		Chain 1	Chain 2	Chain 3
	(MHz)	(MHz)	(MHz)	(MHz)
Low	5180	26.50	26.50	26.42
Mid	5200	26.67	26.42	26.83
High	5240	26.25	26.33	26.67

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26 dB BANDWIDTH, Chain 1





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26 dB BANDWIDTH, Chain 2





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26 dB BANDWIDTH, Chain 3





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8.4.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	99% BW	99% BW	99% BW
		Chain 1	Chain 2	Chain 3
	(MHz)	(MHz)	(MHz)	(MHz)
Low	5180	17.6466	17.6737	17.6130
Mid	5200	17.6387	17.6645	17.6414
High	5240	17.6356	17.6515	17.6278

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99% BANDWIDTH, Chain 1





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99% BANDWIDTH, Chain 1	HIGH CH	RТ	Sweep
Ch Freq 5.24 GHz Occupied Bandwidth	Averages: 100	Trig Free	Sweep Time 20.00 ms Auto <u>Man</u>
			Sweep <u>Single Cont</u>
Ref 20 dBm Atten 20 dB #Samp Log 10 dB/			Auto Sweep Time <u>Norm Accy</u> Gate
Center 5.240 00 GHz #Res BW 180 kHz #VBW 50	50 kHz #Sweep 20 m	Span 50 MHz s (601 pts)	Gate Setup •
Occupied Bandwidth 17.6356 MHz	Occ BW % Pwr x dB	99.00 % -26.00 dB	Points 601
Transmit Freq Error -23.737 kHz x dB Bandwidth 22.679 MHz*			
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99% BANDWIDTH, Chain 2





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99% BANDWIDTH, Chain 3





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Ch Freq 5.24 GHz Trig Free Sweep Tim Occupied Bandwidth Averages: 100 Sweep Tim Auto M Ref 20 dBm Atten 20 dB Sweep Tim Sweep Tim Sweep Tim Log In In In Auto M In In In In In Auto M In In </th <th>99% BANDW</th> <th>IDTH, Chain 3 H</th> <th>IIGH CH</th> <th>RТ</th> <th>Sween</th>	99% BANDW	IDTH, Chain 3 H	IIGH CH	RТ	Sween
Ref 20 dBm Atten 20 dB Swee Log Atten 20 dB Auto Sweep Log Auto Sweep Tim 10 Auto Sweep Tim 0ffst Auto Sweep Tim 10.8 Auto Sweep Gate Setup Center 5.240 00 GHz #VBW 560 kHz #Sweep 20 ms (601 pts) Occupied Bandwidth Occ BW % Pwr 99.00 % 17.6278 MHz x dB<-26.00 dB Transmit Freq Error -16.936 kHz x dB Bandwidth 22.879 MHz*	Ch Freq Occupied Bandwidt	5.24 GHz	Averages: 100	Trig Free	Sweep Time 20.00 ms Auto <u>Mar</u>
Ref 20 dBm Atten 20 dB #Samp					Sweep <u>Single Cont</u>
Center 5.240 00 GHz Span 50 MHz Gate Setup #Res BW 180 kHz #VBW 560 kHz #Sweep 20 ms (601 pts) Point Occupied Bandwidth Occ BW % Pwr 99.00 % Point 17.6278 MHz x dB -26.00 dB 60 Transmit Freq Error -16.936 kHz x dB -26.00 dB	Ref 20 dBm #Samp Log 10 dB/ Offst 10.8	Atten 20 dB		MANNA MILINA LINA	Auto Sweep Time <u>Norm Accy</u> Gate On <u>Off</u>
Occupied Bandwidth Occ BW % Pwr 99.00 % Point 17.6278 MHz x dB -26.00 dB 60 Transmit Freq Error -16.936 kHz 40 -26.00 dB 60 x dB Bandwidth 22.879 MHz* -26.00 dB 60 60	Center 5.240 00 GHz #Res BW 180 kHz	#VBW 560 H	(Hz #Sweep 20	Span 50 MHz ms (601 pts)	Gate Setup
Transmit Freq Error -16.936 kHz x dB Bandwidth 22.879 MHz*	Occupied Ba	andwidth 17.6278 MHz	Occ BW % Pwr x dB	99.00 % -26.00 dB	Points 601
Convergent 2000 2010 Agilant Technologian	Transmit Freq Error x dB Bandwidth	-16.936 kHz 22.879 MHz*			

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8.4.3. AVERAGE POWER

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Average Power Results

Channel	Frequency	Chain 1	Chain 2	Chain 3	Total
		Power	Power	Power	Power
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)
Low	5180	9.20	9.70	8.90	14.05
Mid	5200	9.10	9.80	8.98	14.08
High	5240	9.00	9.30	9.65	14.10

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8.4.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the band 5.15–5.25 GHz, 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. In addition, 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 maximum conducted output 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.

DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Chain 1	Chain 2	Chain 3	Uncorrelated Chains
Antenna	Antenna	Antenna	Directional
Gain	Gain	Gain	Gain
(dBi)	(dBi)	(dBi)	(dBi)
4.16	2.51	5.65	4.29

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RESULTS

Limits

Channel	Frequency	Fixed	В	4 + 10 Log B	Directional	Power	PPSD
		Limit		Limit	Gain	Limit	Limit
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)	(dBm)
Low	5180	17	26.50	18.23	4.29	17.00	4.00
Mid	5200	17	26.83	18.29	4.29	17.00	4.00
High	5240	17	26.67	18.26	4.29	17.00	4.00

Output Power Results

Channel	Frequency	Chain 1	Chain 2	Chain 3	Total	Power	Power
		Meas Power	Meas Power	Meas Power	Corr'd Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	9.428	10.808	9.490	14.728	17.00	-2.272
Mid	5200	9.270	10.670	9.420	14.605	17.00	-2.395
High	5240	9.073	9.518	9.447	14.122	17.00	-2.878

PPSD Results

Channel	Frequency	Chain 1	Chain 2	Chain 3	Total	PPSD	PPSD
		Meas PPSD	Meas PPSD	Meas PPSD	Corr'd PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5180	-2.41	-1.00	-2.21	2.94	4.00	-1.06
Mid	5200	-2.58	-1.17	-2.27	2.81	4.00	-1.19
High	5240	-2.80	-2.23	-2.27	2.35	4.00	-1.65

OUTPUT POWER AND PPSD, Chain 1





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OUTPUT POWER AND PPSD, Chain 2





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OUTPUT POWER AND PPSD, Chain 3





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8.4.5. 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.

RESULTS

Channel	Frequency	Pk Exc	Pk Exc	Pk Exc	Limit	Worst-Case
		Chain 1	Chain 2	Chain 3		Margin
	(MHz)	(dB)	(dB)	(dB)	(dB)	(dB)
Low	5180	10.97	9.96	9.91	13	-2.0
Mid	5200	10.18	9.79	10.01	13	-2.8
High	5240	9.93	10.55	10.32	13	-2.5

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PEAK EXCURSION, Chain 1





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PEAK EXCURSION, Chain 2





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PEAK EXCURSION, Chain 3





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8.5. 802.11n HT40, 1TX, CDD MCS0, 5.2 GHz BAND

8.5.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5190	40.17
High	5230	42.00

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26 dB BANDWIDTH





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8.5.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	5190	36.0812
High	5230	36.0029

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99% BANDWIDTH





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8.5.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency	Power
	(MHz)	(dBm)
Low	5190	14.5
High	5230	16.0

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8.5.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the band 5.15–5.25 GHz, 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. In addition, 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 maximum conducted output 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.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

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RESULTS

Limits

Channel	Frequency	Fixed	B 4 + 10 Log B		Directional	Power	PPSD
		Limit	Limit		Gain	Limit	Limit
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)	(dBm)
Low	5190	17	40.17	20.04	5.65	17.00	4.00
High	5230	17	42.00	20.23	5.65	17.00	4.00

Output Power Results

Channel	Frequency	Meas	Corr'd	Power	Power
		Power	Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dB)
Low	5190	14.962	14.962	17.00	-2.038
High	5230	16.271	16.271	17.00	-0.729

PPSD Results

Channel	Frequency	Meas	Corr'd	PPSD	PPSD
		PPSD	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dB)
Low	5190	1.50	1.50	4.00	-2.50
High	5230	2.61	2.61	4.00	-1.39

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OUTPUT POWER AND PPSD





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8.5.5. 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.

RESULTS

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5190	9.10	13	-3.90
High	5230	9.34	13	-3.66

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PEAK EXCURSION





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8.6. 802.11n HT40, CDD MCS0, 2TX, 5.2 GHz BAND

8.6.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	26 dB BW	26 dB BW
		Chain 1	Chain 2
	(MHz)	(MHz)	(MHz)
Low	5190	39.83	39.67
High	5230	40.00	39.50

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8.6.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	99% BW	99% BW
		Chain 1	Chain 2
	(MHz)	(MHz)	(MHz)
Low	5190	36.0508	36.1021
High	5230	36.0330	36.1473

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8.6.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Average Power Results

Channel	Frequency	Chain 1	Chain 2	Total
		Power	Power	Power
	(MHz)	(dBm)	(dBm)	(dBm)
Low	5190	11.60	11.65	14.64
High	5230	10.60	10.60	13.61

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8.6.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands 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 megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output 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.

DIRECTIONAL ANTENNA GAIN

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

Chain 1	Chain 2	Correlated Chains
Antenna	Antenna	Directional
Gain	Gain	Gain
(dBi)	(dBi)	(dBi)
4.16	5.65	7.95

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RESULTS

Limits

Channel	Frequency	Fixed	В	4 + 10 Log B	Directional	Power	PPSD
		Limit		Limit	Gain	Limit	Limit
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)	(dBm)
Low	5190	17	39.67	19.98	7.95	15.05	2.05
High	5230	17	39.50	19.97	7.95	15.05	2.05

Output Power Results

Channel	Frequency	Chain 1	Chain 2	Total	Power	Power
		Meas Power	Meas Power	Corr'd Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5190	11.088	12.019	14.589	15.05	-0.461
High	5230	10.905	11.150	14.040	15.05	-1.010

PPSD Results

Channel	Frequency	Chain 1	Chain 2	Total	PPSD	PPSD
		Meas PPSD	Meas PPSD	Corr'd PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5190	-2.26	-1.49	1.15	2.05	-0.90
High	5230	-2.56	-2.41	0.53	2.05	-1.52

OUTPUT POWER AND PPSD, Chain 1





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OUTPUT POWER AND PPSD, Chain 2





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8.6.5. 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.

RESULTS

Channel	Frequency	Pk Exc	Pk Exc	Limit	Worst-Case
		Chain 1	Chain 2		Margin
	(MHz)	(dB)	(dB)	(dB)	(dB)
Low	5190	9.65	10.22	13	-2.8
High	5230	9.48	9.69	13	-3.3

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8.7. 802.11n HT40, CDD MCS0, 3TX, 5.2 GHz BAND

Note: Only AVG power and Peak Excursion were performed for this mode based on client's test plan.

8.7.1. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Average Power Results

Channel	Frequency	Chain 1	Chain 2	Chain 3	Total
		Power	Power	Power	Power
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)
Low	5190	14.50	14.50	14.60	19.30
High	5230	18.10	18.10	18.00	22.84

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8.7.2. 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.

RESULTS

Channel	Frequency	Pk Exc	Pk Exc	Pk Exc	Limit	Worst-Case
		Chain 1	Chain 2	Chain 3		Margin
	(MHz)	(dB)	(dB)	(dB)	(dB)	(dB)
Low	5190	9.16	9.56	9.52	13	-3.4
High	5230	8.60	10.09	10.12	13	-2.9

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8.8. 802.11n HT40, STBC MCS0, 3TX, 5.2 GHz BAND

8.8.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	26 dB BW	26 dB BW	26 dB BW
		Chain 1	Chain 2	Chain 3
	(MHz)	(MHz)	(MHz)	(MHz)
Low	5190	40.00	39.67	40.00
High	5230	39.83	39.67	40.17

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8.8.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	99% BW	99% BW	99% BW
		Chain 1	Chain 2	Chain 3
	(MHz)	(MHz)	(MHz)	(MHz)
Low	5190	36.0121	36.0246	36.0675
High	5230	36.0397	35.9789	36.0740

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8.8.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Average Power Results

Channel	Frequency	Chain 1	Chain 2	Chain 3	Total
		Power	Power	Power	Power
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)
Low	5190	12.10	12.12	12.00	16.84
High	5230	12.15	12.20	12.00	16.89

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8.8.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the band 5.15–5.25 GHz, 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. In addition, 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 maximum conducted output 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.

DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Chain 1	Chain 2	Chain 3	Uncorrelated Chains
Antenna	Antenna	Antenna	Directional
Gain	Gain	Gain	Gain
(dBi)	(dBi)	(dBi)	(dBi)
4.16	2.51	5.65	4.29

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RESULTS

Limits

Channel	Frequency	Fixed	В	4 + 10 Log B	Directional	Power	PPSD
		Limit		Limit	Gain	Limit	Limit
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)	(dBm)
Low	5190	17	40.00	20.02	4.29	17.00	4.00
High	5230	17	40.17	20.04	4.29	17.00	4.00

Output Power Results

Channel	Frequency	Chain 1	Chain 2	Chain 3	Total	Power	Power
		Meas Power	Meas Power	Meas Power	Corr'd Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5190	12.218	12.189	12.218	16.980	17.00	-0.020
High	5230	11.860	11.765	11.755	16.565	17.00	-0.435

PPSD Results

Channel	Frequency	Chain 1	Chain 2	Chain 3	Total	PPSD	PPSD
		Meas PPSD	Meas PPSD	Meas PPSD	Corr'd PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
Low	5190	-1.25	-1.35	-1.25	3.49	4.00	-0.51
High	5230	-1.83	-1.71	-1.76	3.00	4.00	-1.00

OUTPUT POWER AND PPSD, Chain 1





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OUTPUT POWER AND PPSD, Chain 2





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OUTPUT POWER AND PPSD, Chain 3





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8.8.5. 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.

RESULTS

Channel	Frequency	Pk Exc	Pk Exc	Pk Exc	Limit	Worst-Case
		Chain 1	Chain 2	Chain 3		Margin
	(MHz)	(dB)	(dB)	(dB)	(dB)	(dB)
Low	5190	9.85	10.51	10.16	13	-2.5
High	5230	10.38	9.65	9.49	13	-2.6

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PEAK EXCURSION, Chain 1





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PEAK EXCURSION, Chain 2





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PEAK EXCURSION, Chain 3





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8.9. 802.11a, Legacy, 1TX, 5.3 GHz BAND

8.9.1. 26dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel Frequency		26dB Bandwidth
	(MHz)	(MHz)
Low	5260	38.67
Mid	5300	37.92
High	5320	33.92

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26dB BANDWIDTH





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8.9.2. 99% dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	5260	16.5669
Mid	5300	16.5918
High	5320	16.5575

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99% BANDWIDTH





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8.9.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.8 dB (including 10 dB pad and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency	Power
	(MHz)	(dBm)
Low	5260	19.0
Mid	5300	19.2
High	5320	18.1

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8.9.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands 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 megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output 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.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

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RESULTS

Limits

Channel	Frequency	Fixed	В	11 + 10 Log B	Directional	Power	PPSD
		Limit		Limit	Gain	Limit	Limit
	(MHz)	(dBm)	(MHz)	(dBm)	(dBi)	(dBm)	(dBm)
Low	5260	24	38.67	26.87	5.61	24.00	11.00
Mid	5300	24	37.92	26.79	5.61	24.00	11.00
High	5320	24	33.92	26.30	5.61	24.00	11.00

Output Power Results

Channel	Frequency	Meas	Corr'd	Power	Power
		Power	Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dB)
Low	5260	19.365	19.365	24.00	-4.64
Mid	5300	19.181	19.181	24.00	-4.82
High	5320	18.260	18.260	24.00	-5.74

PPSD Results

Channel	Frequency	Meas	Corr'd	PPSD	PPSD
		PPSD	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dBm)	(dB)
Low	5260	7.84	7.84	11.00	-3.16
Mid	5300	7.63	7.63	11.00	-3.37
High	5320	6.73	6.73	11.00	-4.27

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OUTPUT POWER AND PPSD





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8.9.5. 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.

RESULTS

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5260	9.19	13	-3.8
Mid	5300	9.18	13	-3.8
High	5320	9.15	13	-3.9

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PEAK EXCURSION





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8.10. 802.11n HT20, CDD MCS0, 3TX, 5.3 GHz BAND

8.10.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	26 dB BW	26 dB BW	26 dB BW
		Chain 1	Chain 2	Chain 3
	(MHz)	(MHz)	(MHz)	(MHz)
Low	5260	27.42	25.67	26.50
Mid	5300	26.92	26.33	27.08
High	5320	27.42	26.08	27.83

COMPLIANCE CERTIFICATION SERVICES (UL CCS)FORM NO: CCSUP4701E47173 BENICIA STREET, FREMONT, CA 94538, USATEL: (510) 771-1000FAX: (510) 661-0888This report shall not be reproduced except in full, without the written approval of UL CCS.

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26 dB BANDWIDTH, Chain 2





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